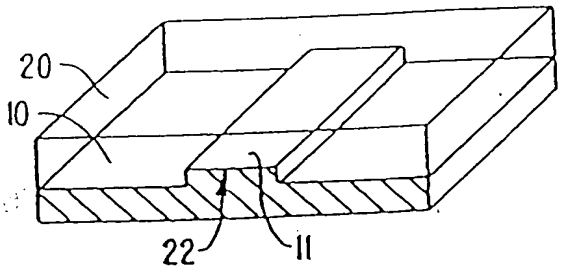


FIG. 1.

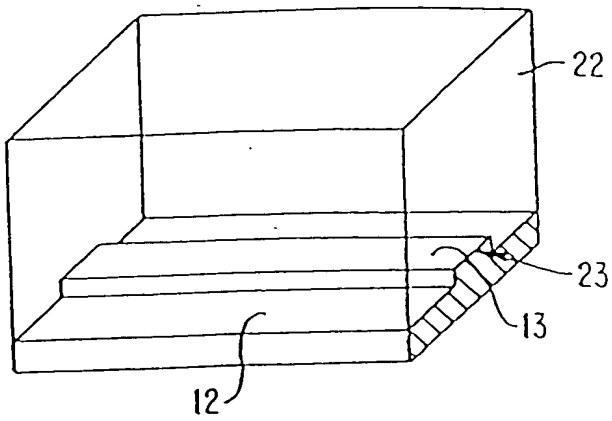


FIG. 2.

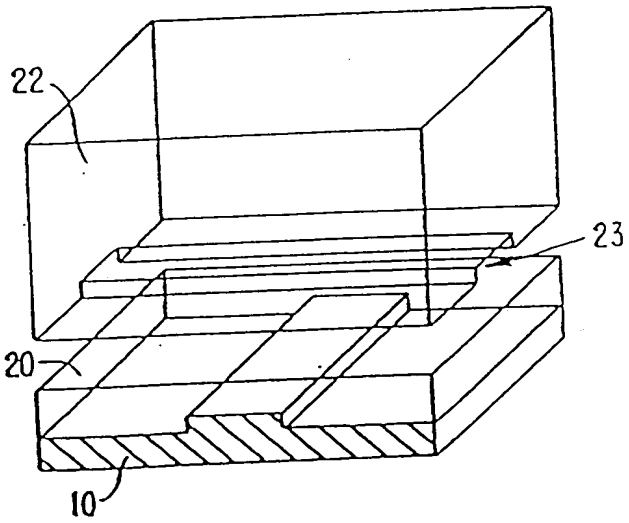


FIG. 3.

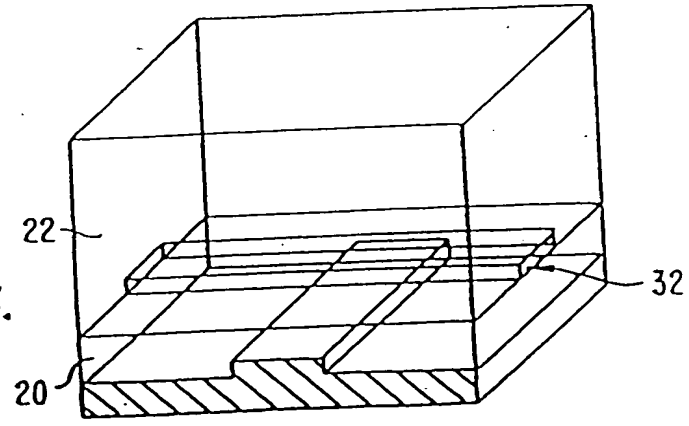


FIG. 4.

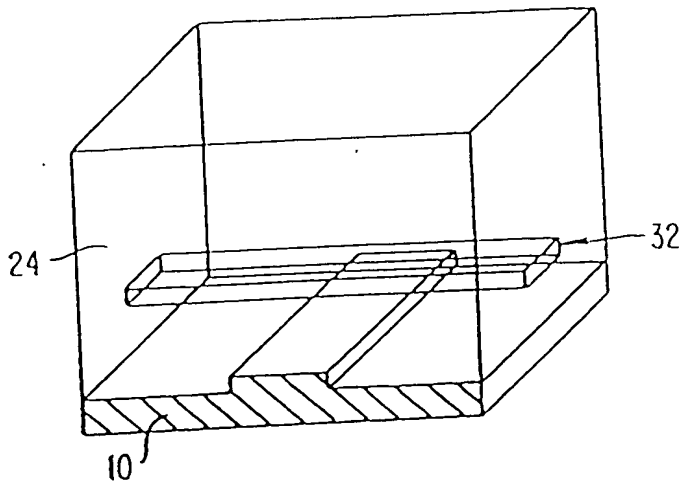


FIG. 5.

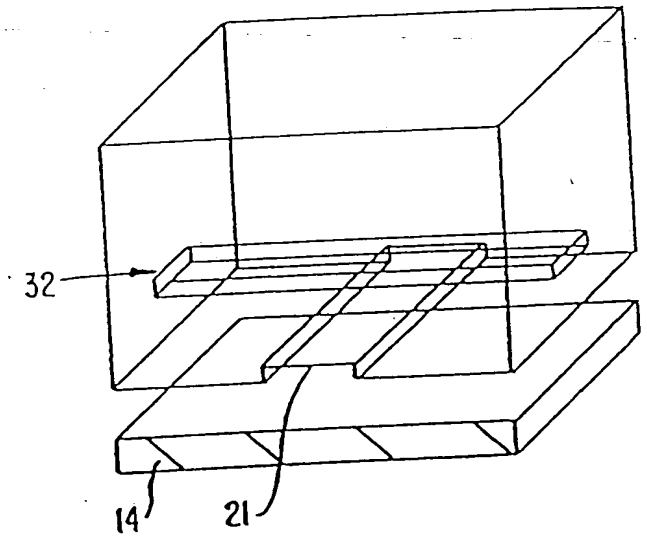


FIG. 6.

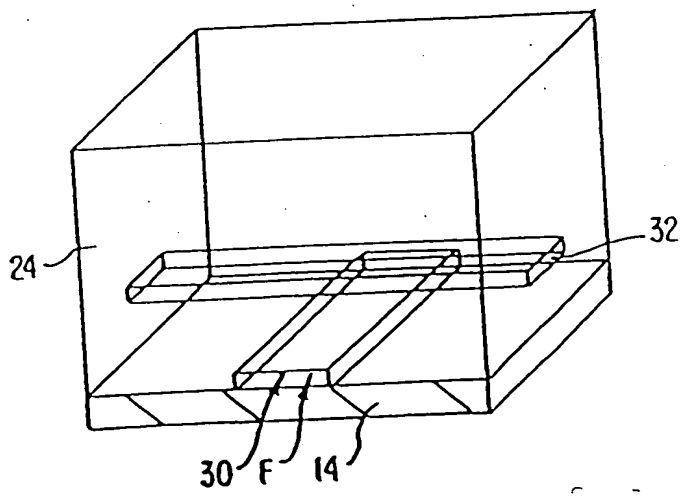


FIG. 7A.

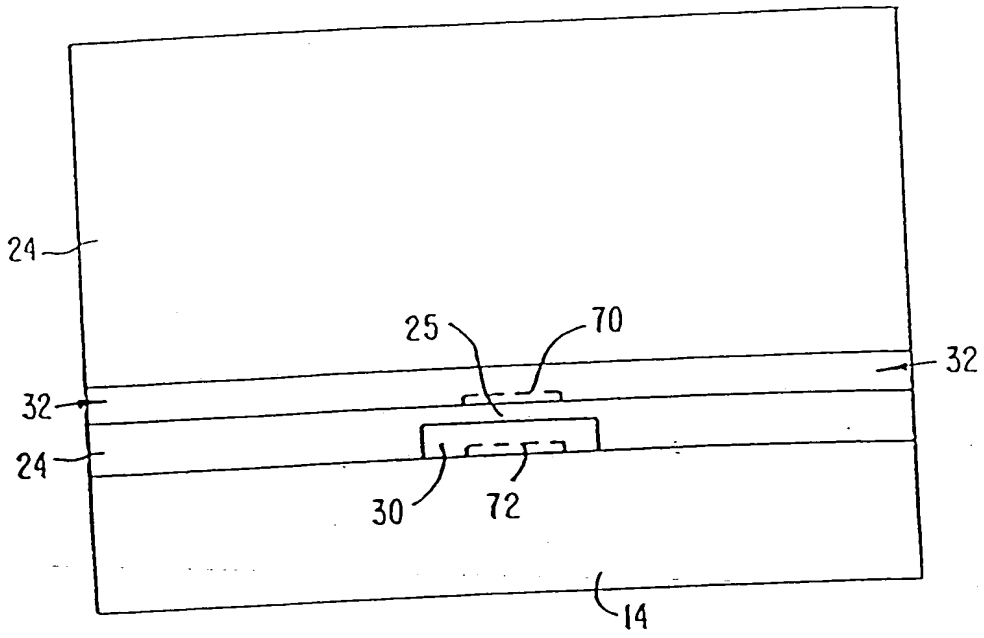


FIG. 7B.

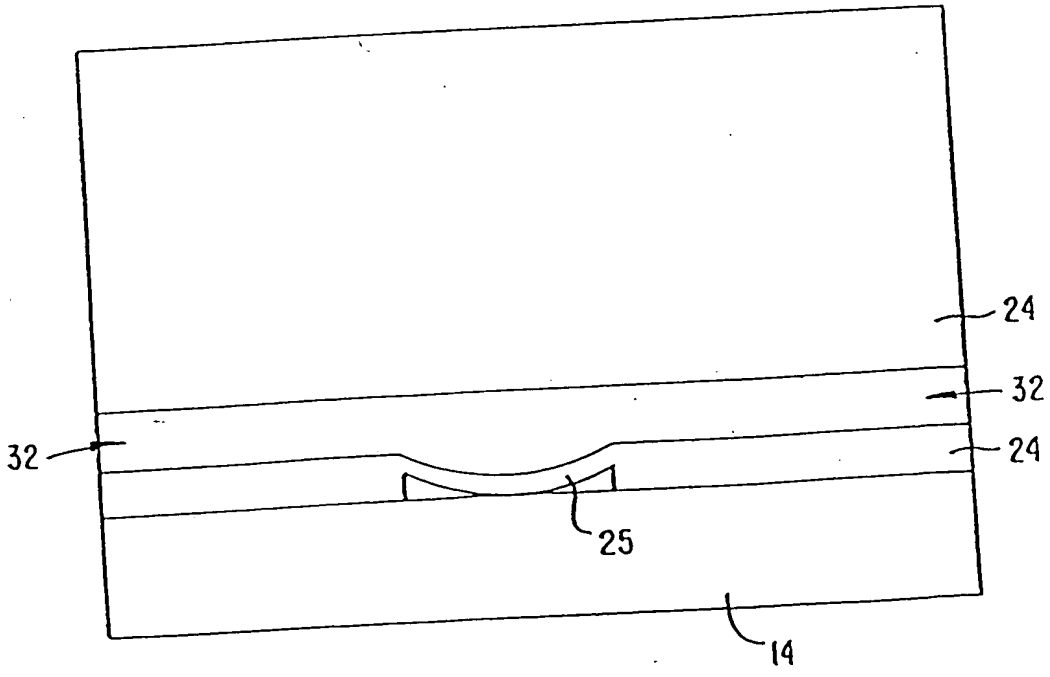


FIG. 7H.

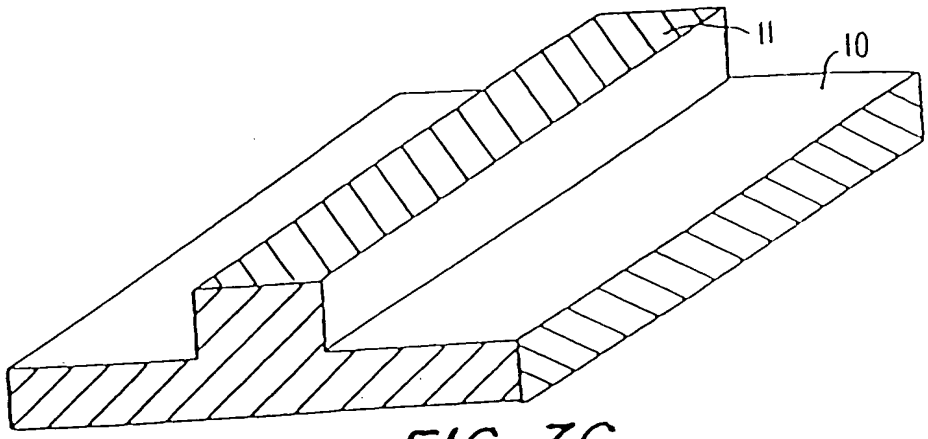


FIG. 7C.

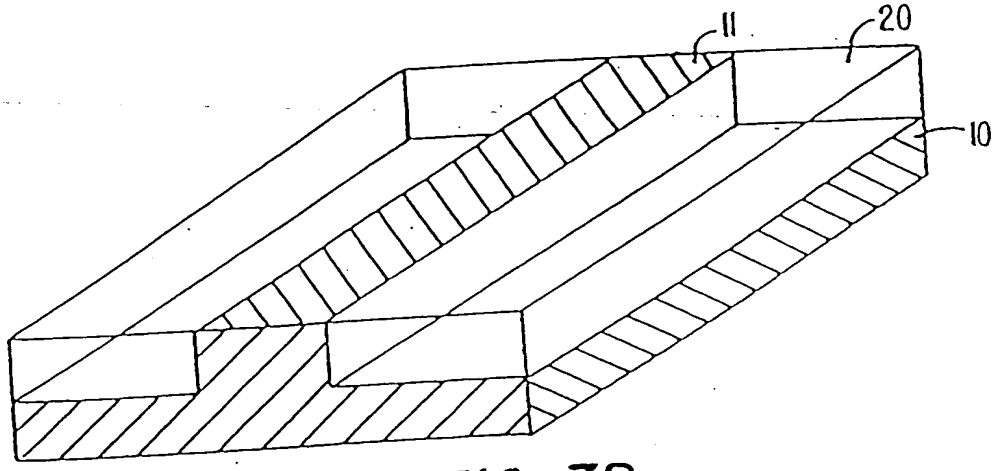


FIG. 7D.

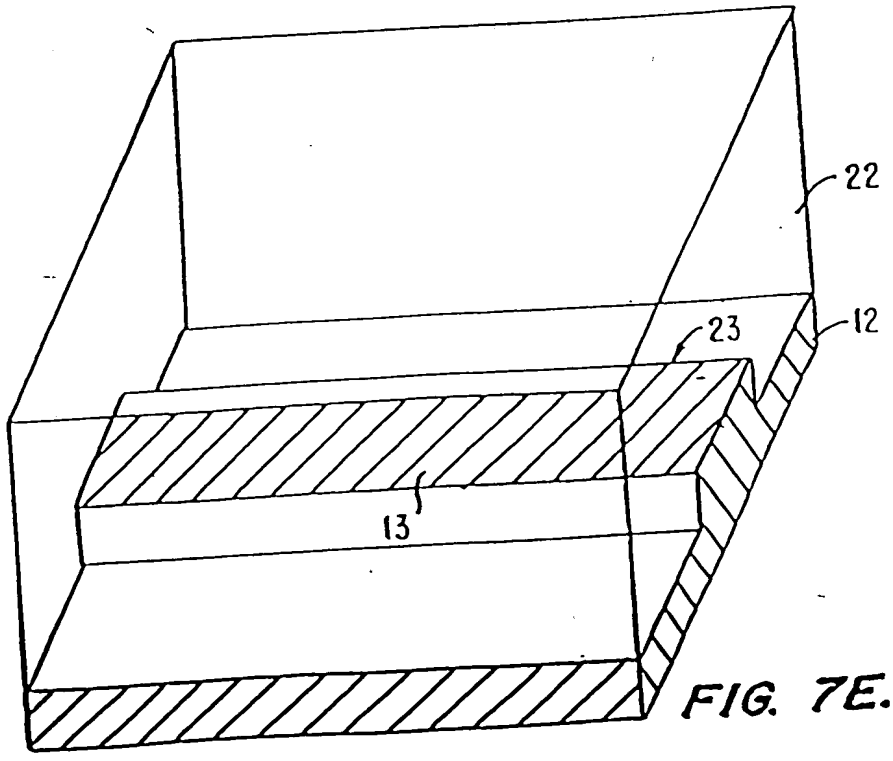


FIG. 7E.

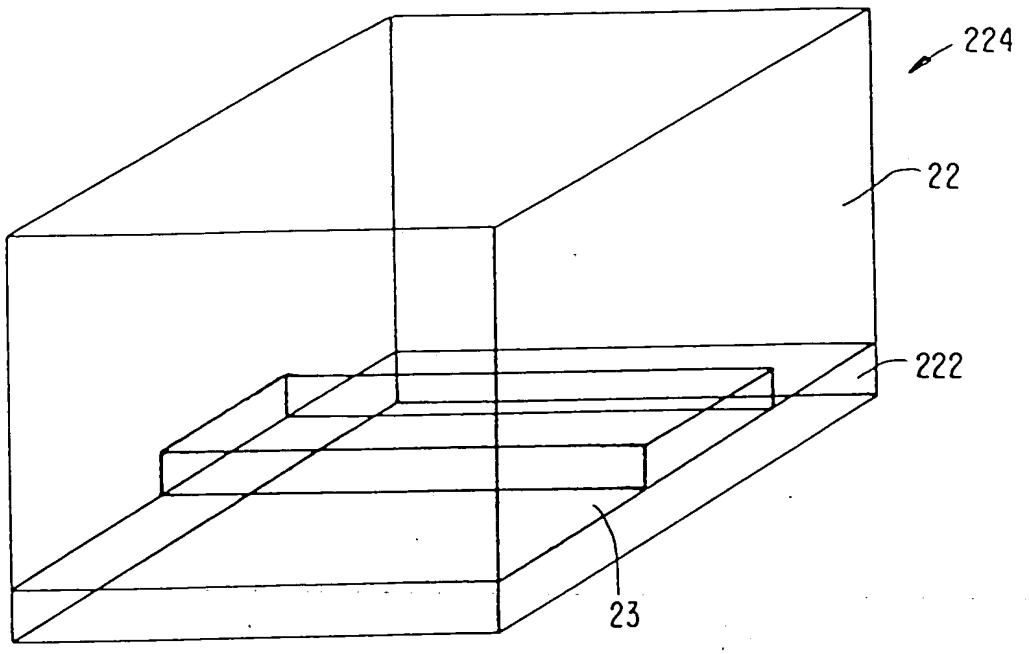


FIG. 7F.

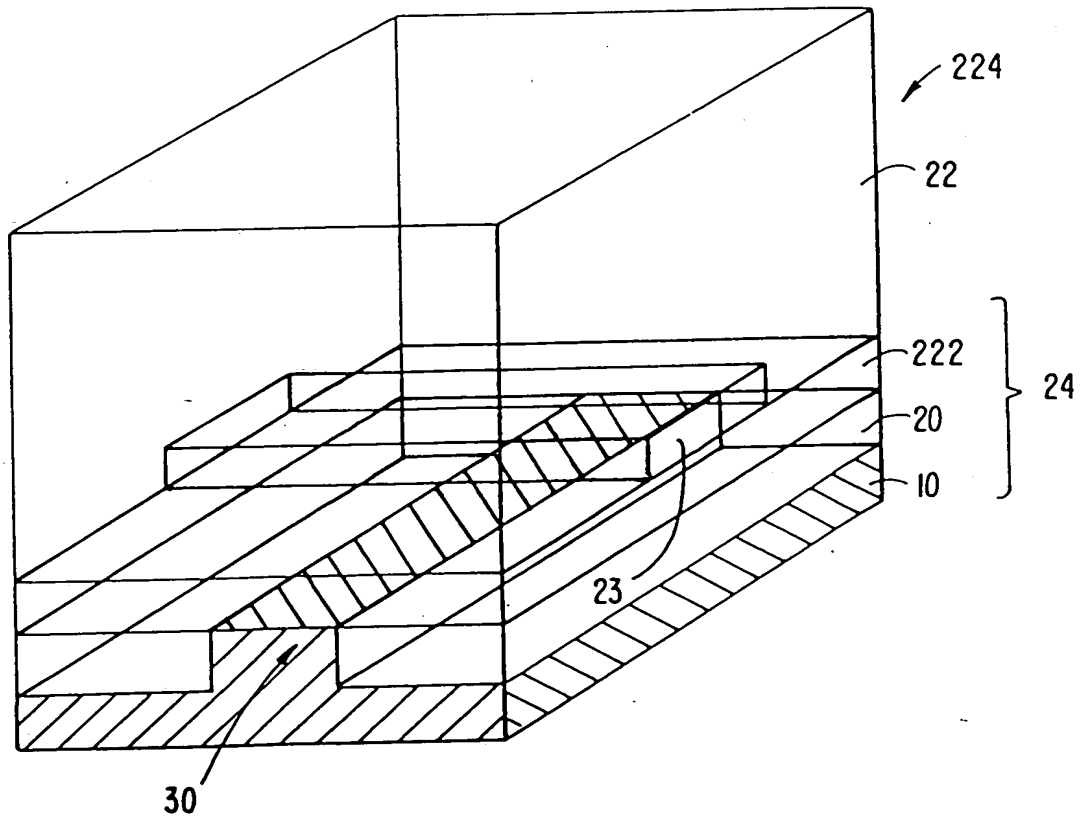


FIG. 7G.

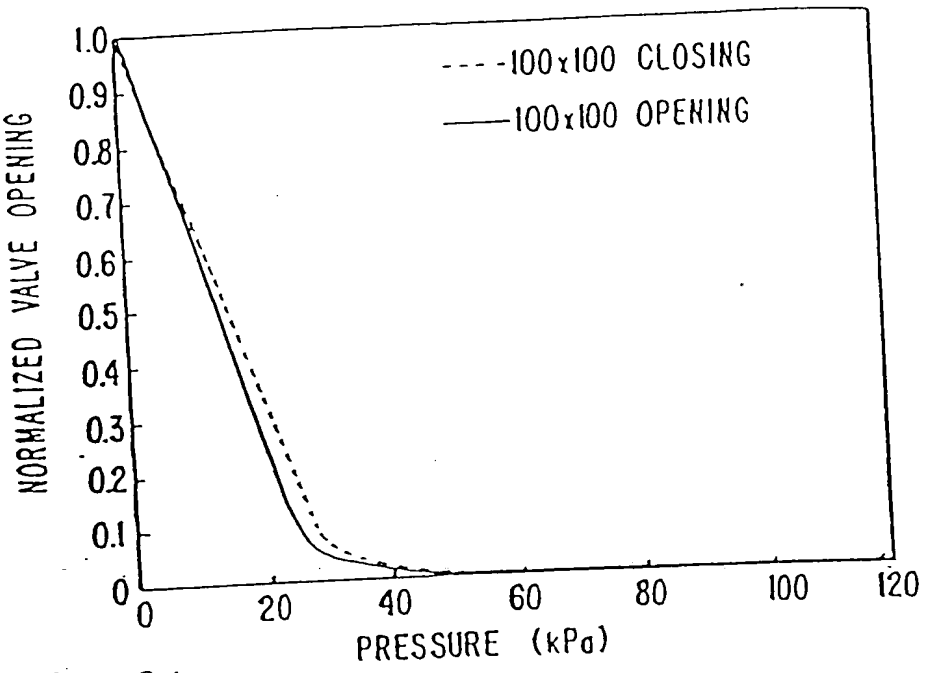

NORMALIZED VALVE OPENING
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
20
40
60
80
100
120
PRESSURE (kPa)
---- 100x100 CLOSING
—— 100x100 OPENING

FIG. 8A

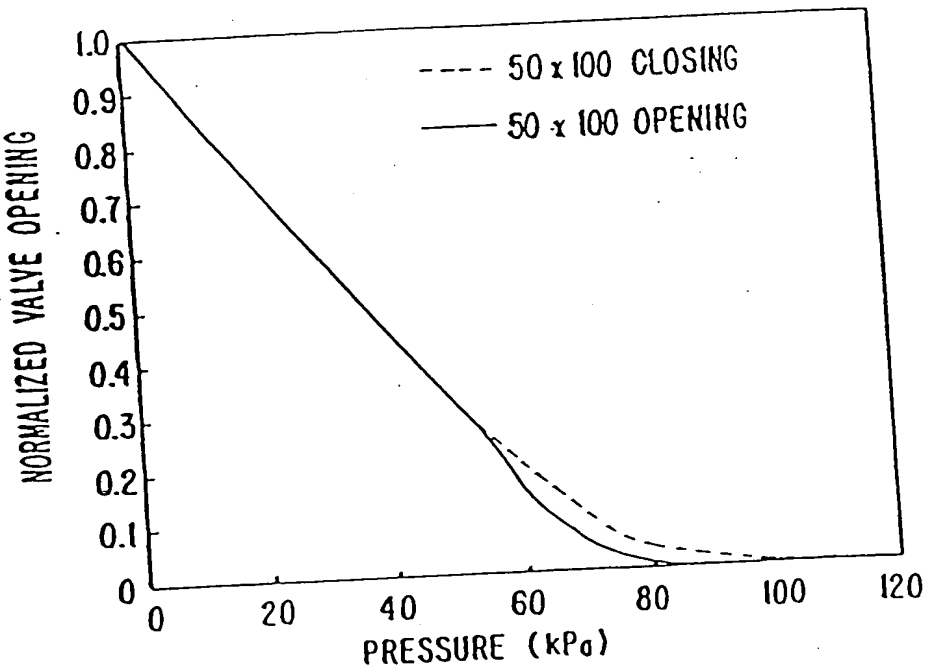

NORMALIZED VALVE OPENING
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
20
40
60
80
100
120
PRESSURE (kPa)
---- 50 x 100 CLOSING
—— 50 x 100 OPENING

FIG. 8B

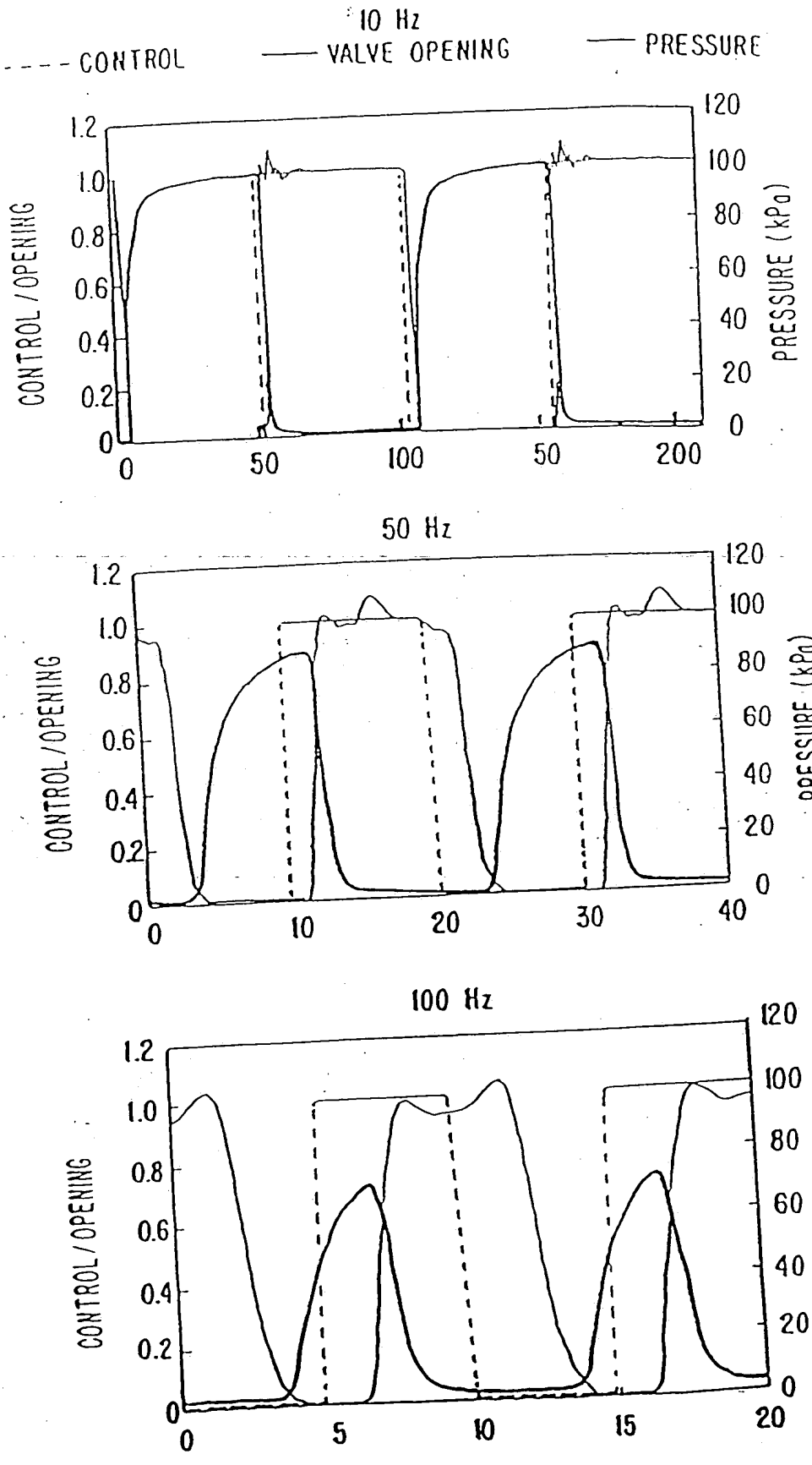

10 Hz
CONTROL
VALVE OPENING
PRESSURE
CONTROL/OPENING
PRESSURE (kPa)
50 Hz
100 Hz

FIG. 9

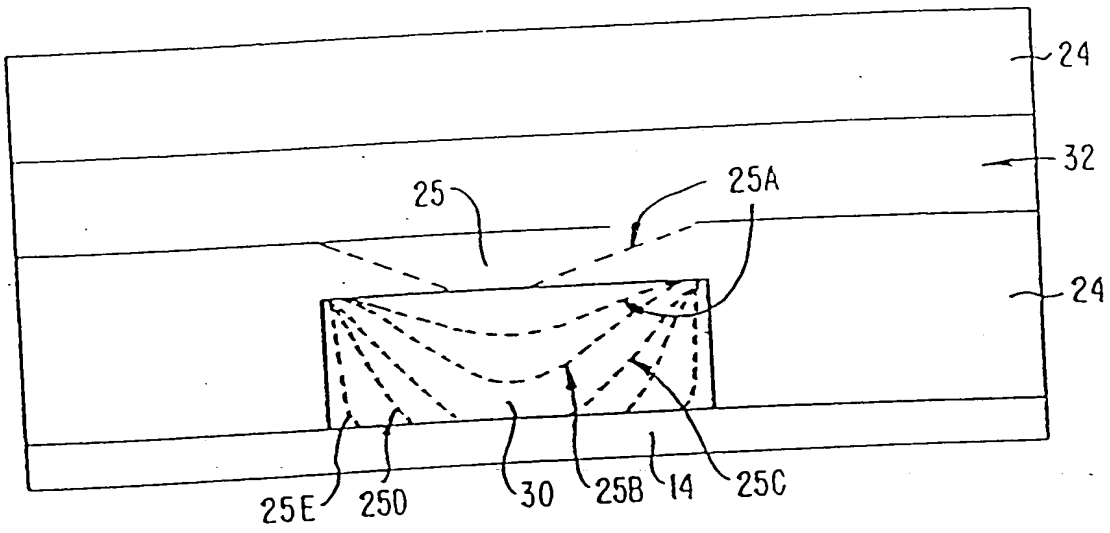

24
32
25
25A
24
25E
25D
30
25B
14
25C

FIG. 10.

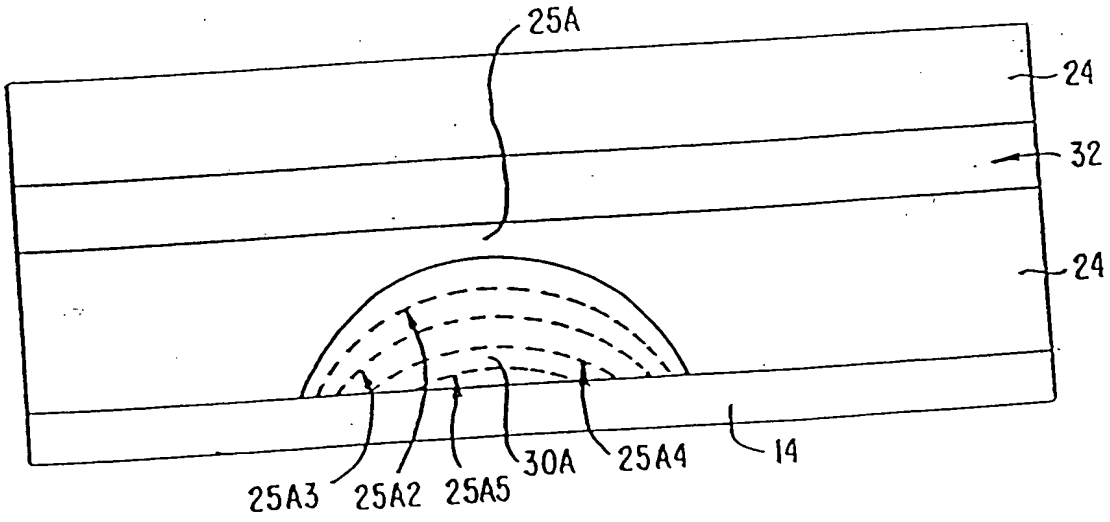

25A
24
32
24
25A3
25A2
25A5
30A
25A4
14

FIG. 11.

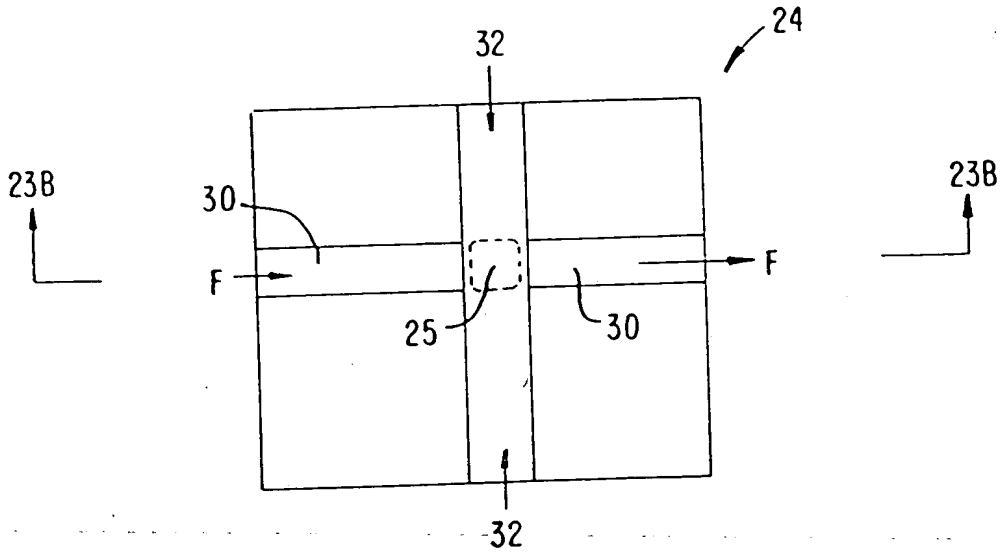


FIG. 12A.

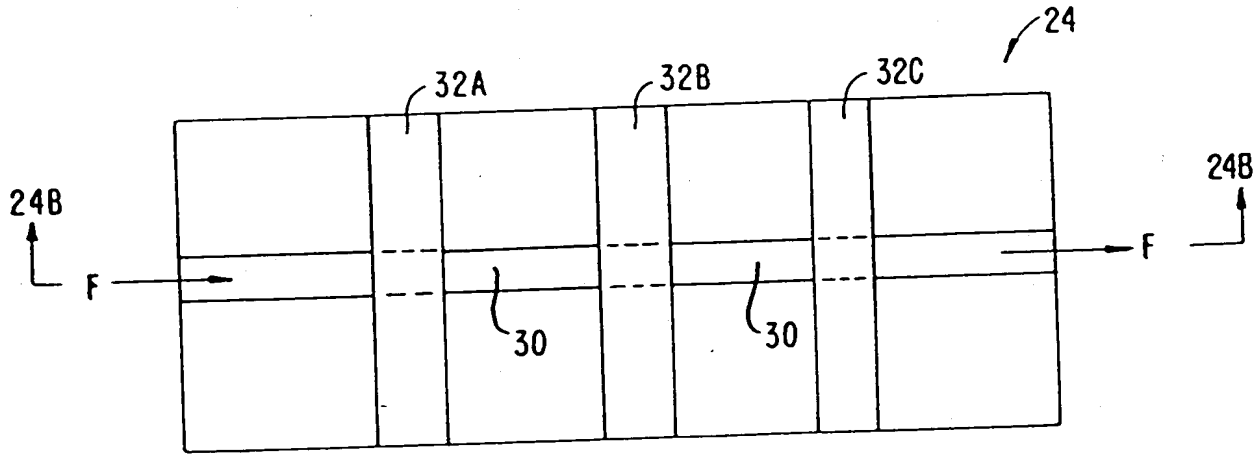


FIG. 13A.

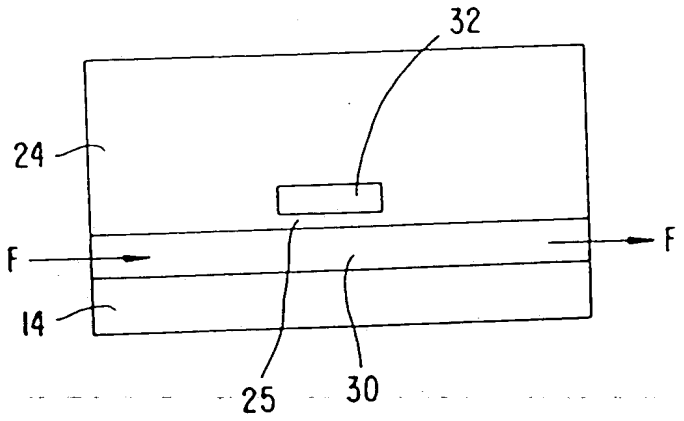


FIG. 12B.

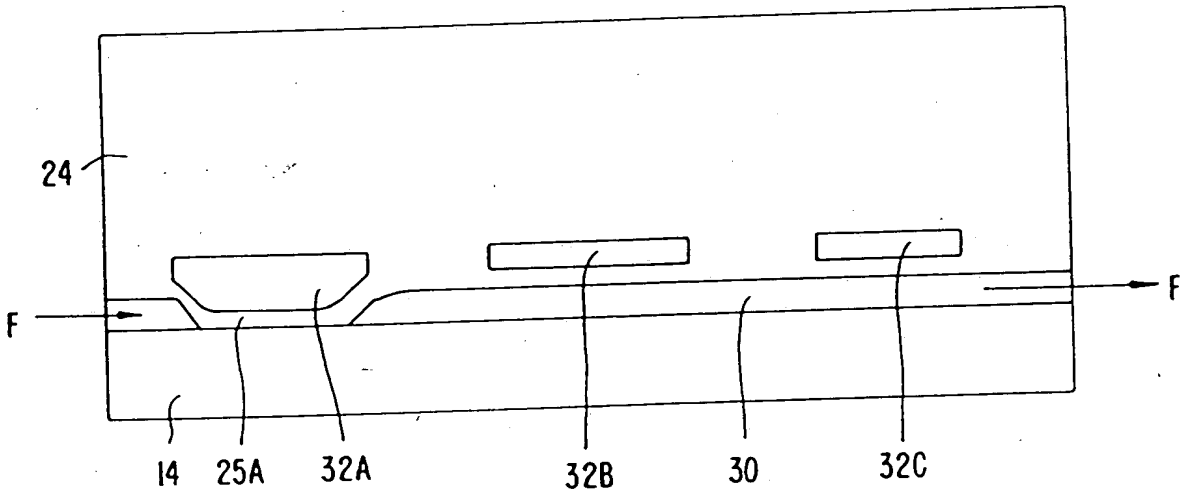


FIG. 13B.

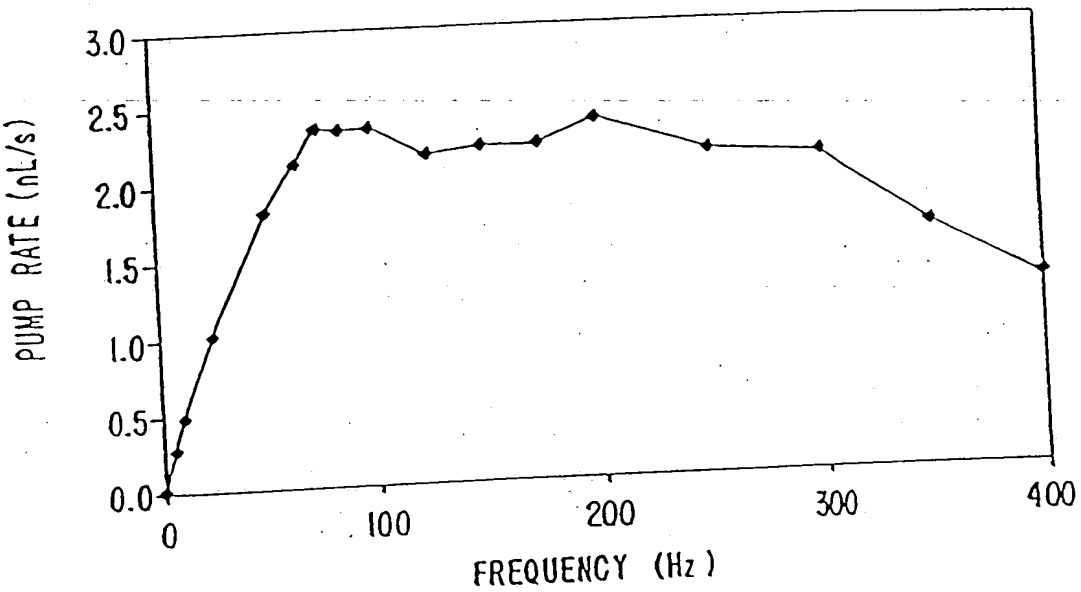


FIG. 14

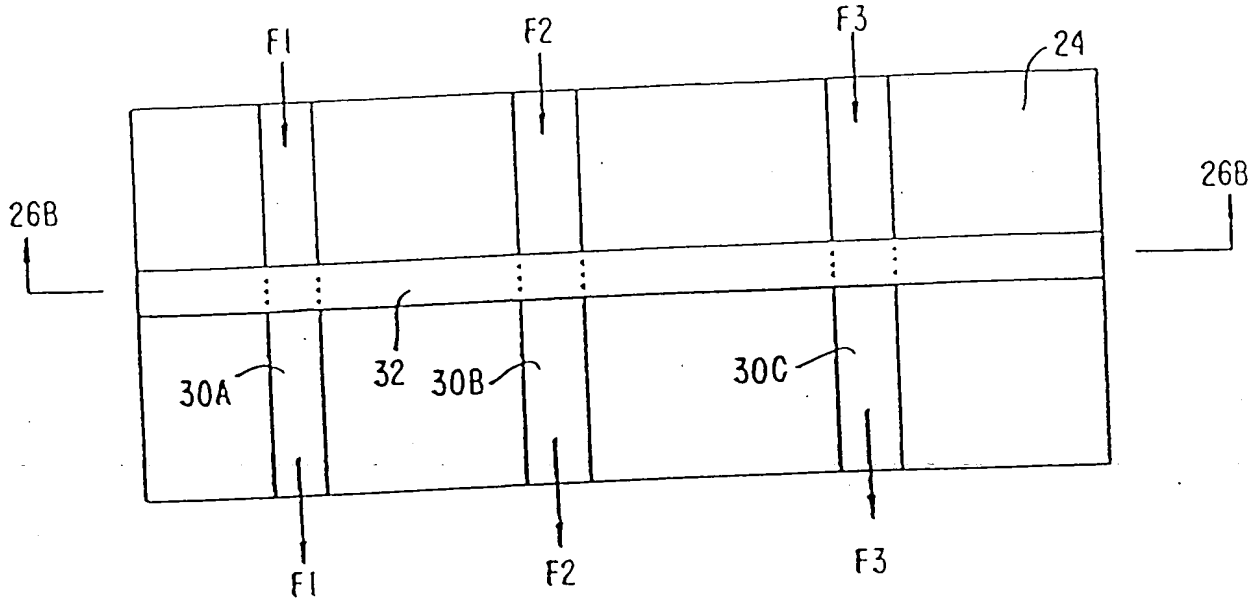


FIG. 15A.

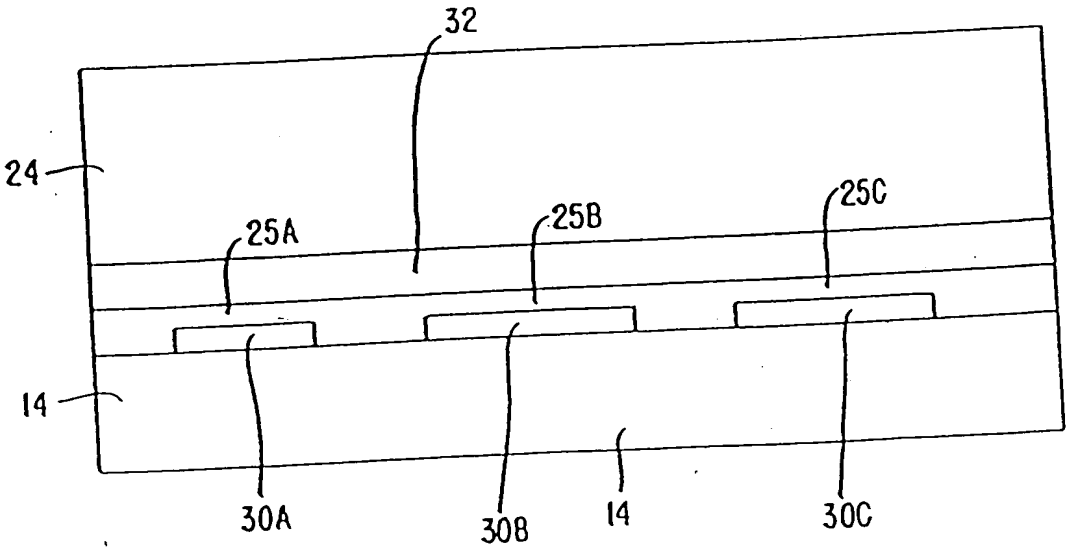


FIG. 15B.

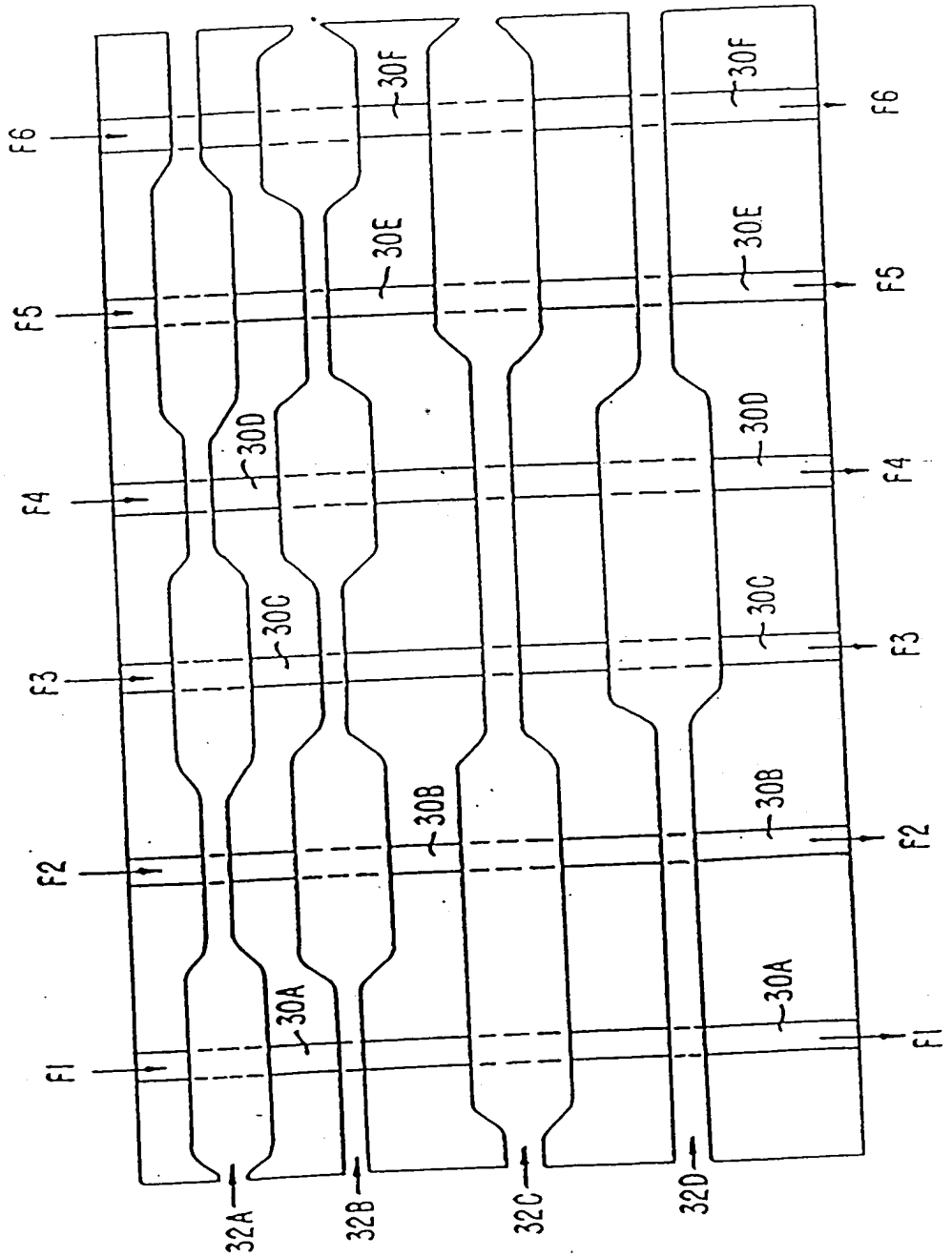


FIG. 16

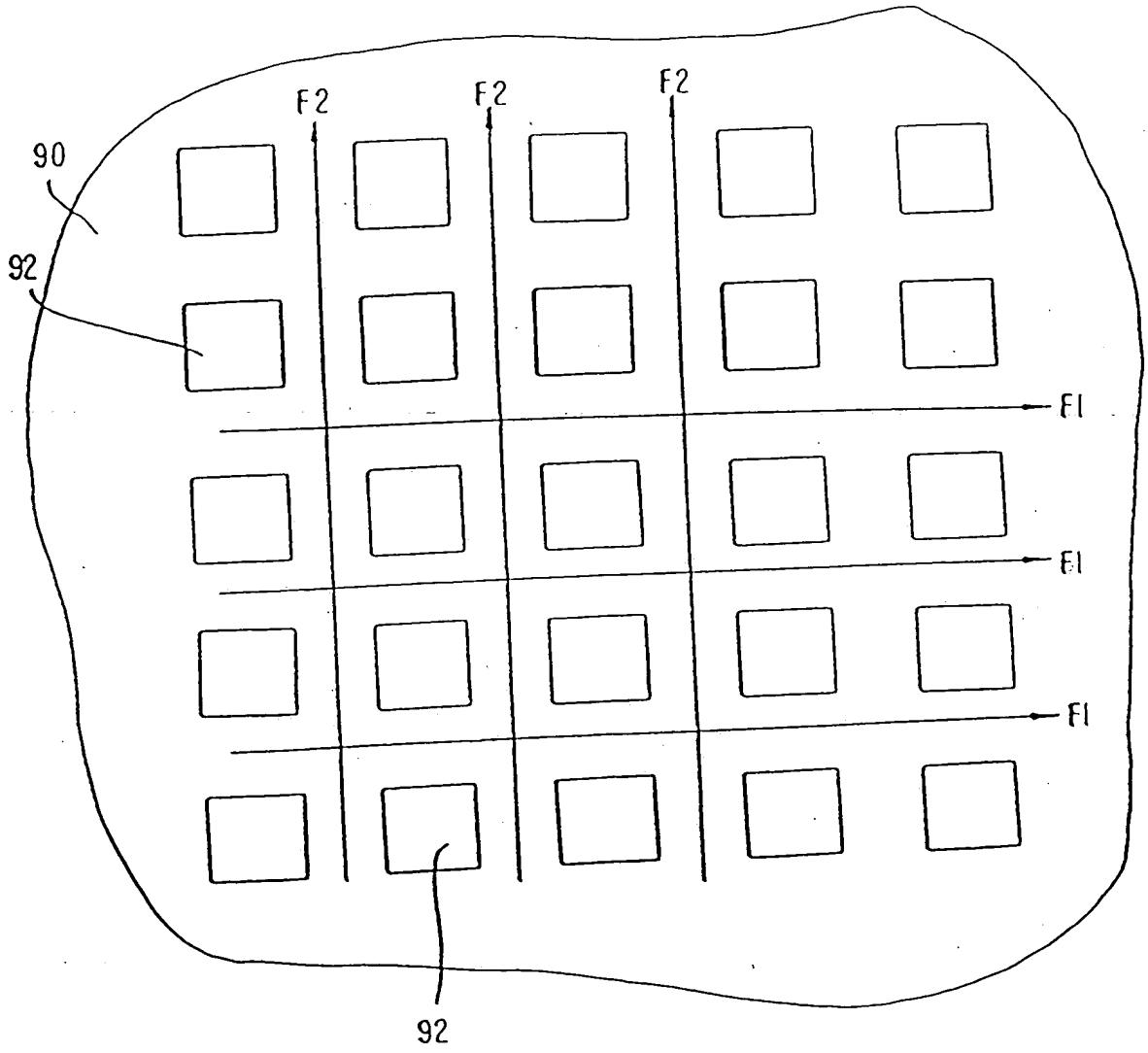


FIG. 17A.

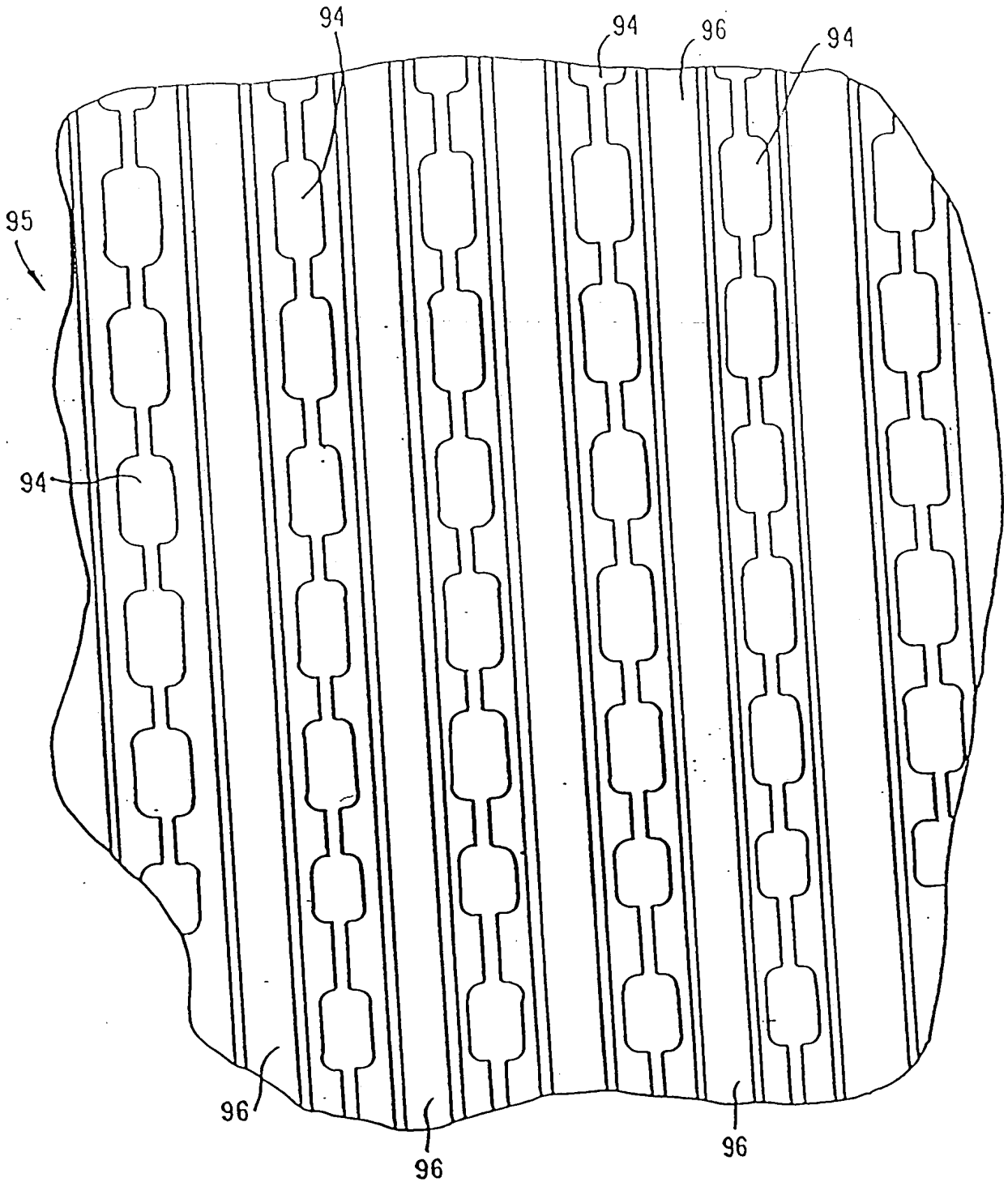


FIG. 17B.

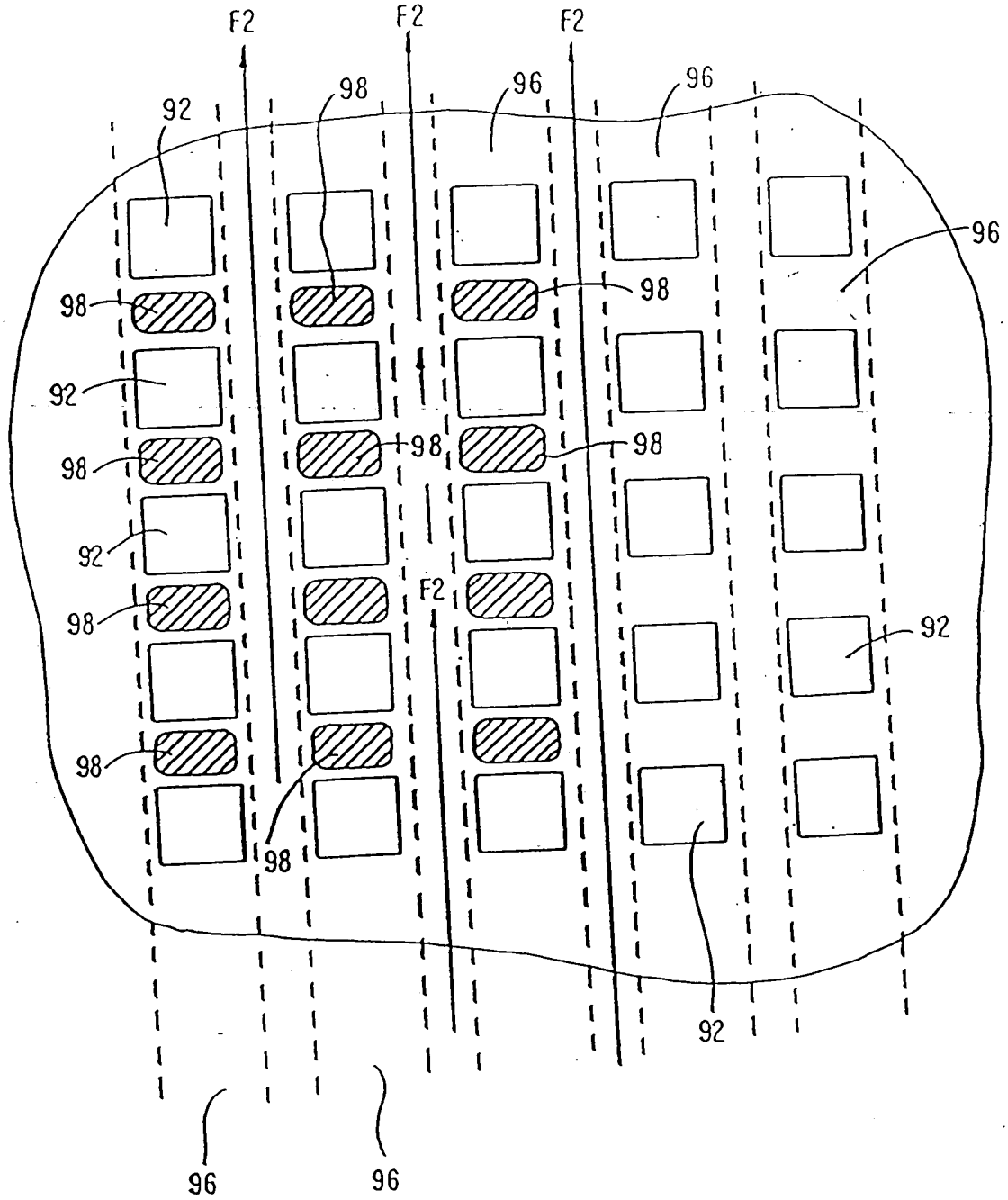


FIG. 17C.

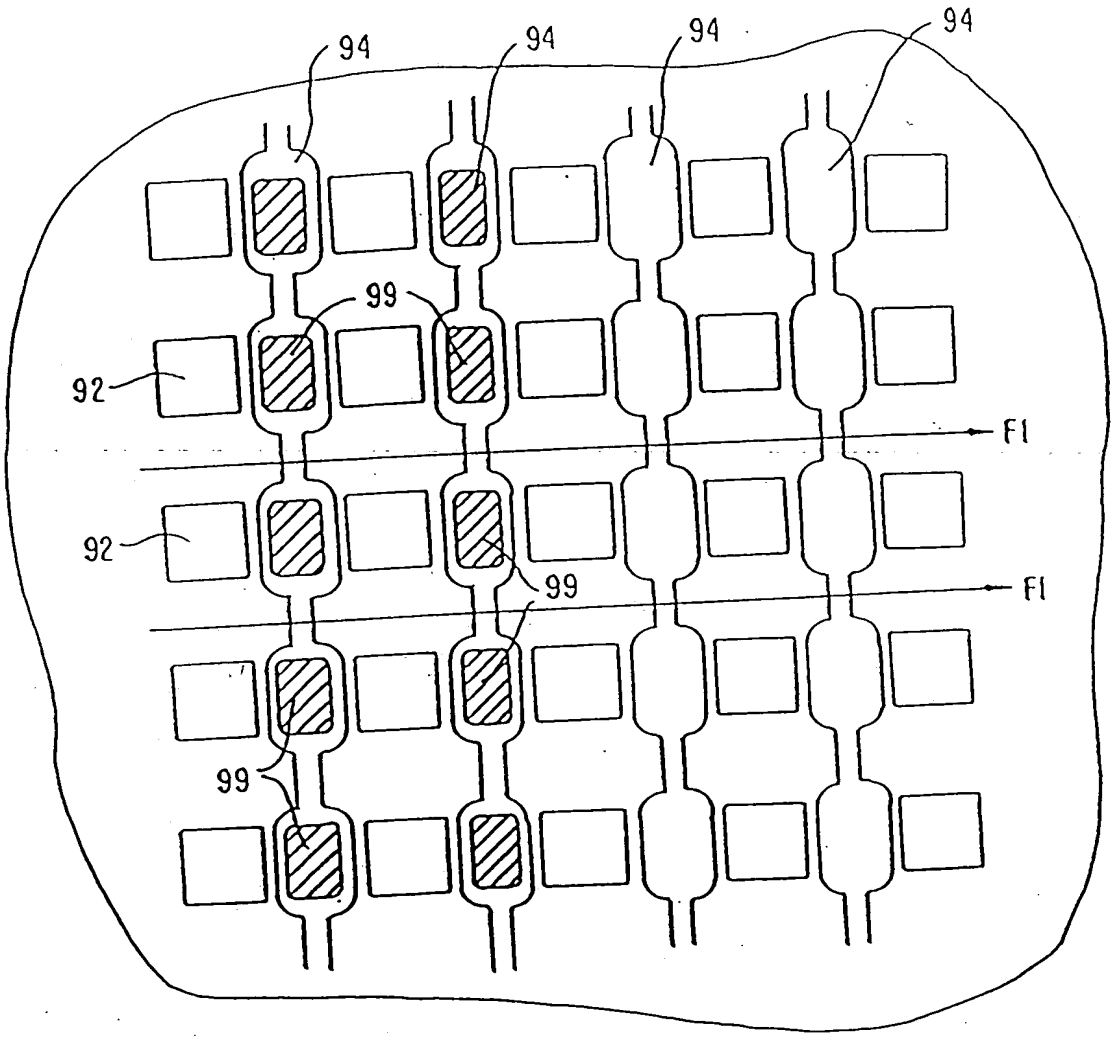


FIG. 17D.

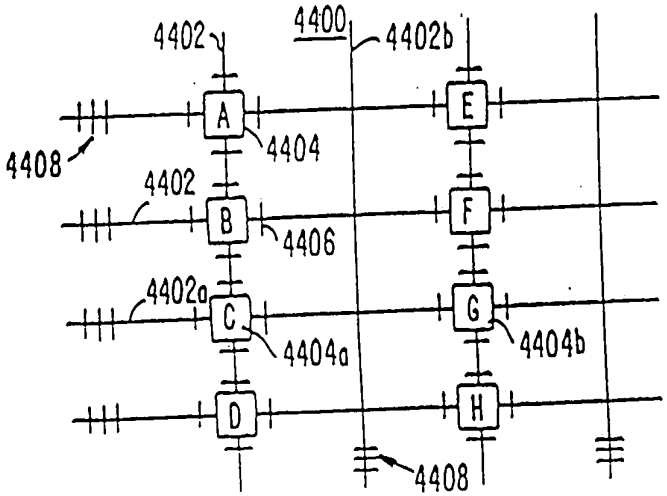


FIG. 18A.

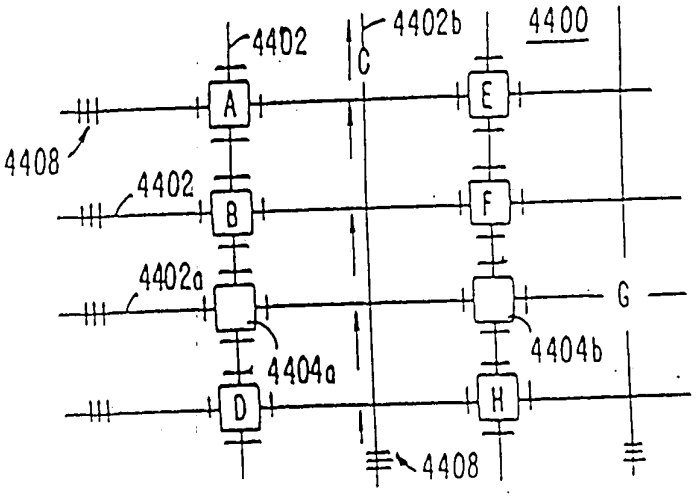


FIG. 18C.

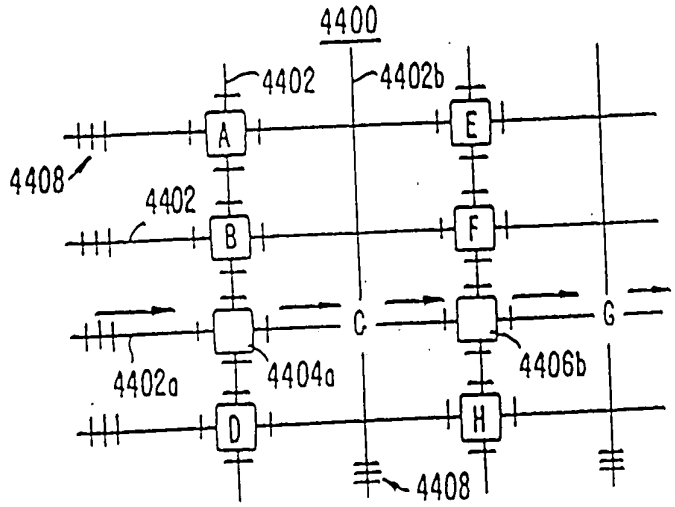


FIG. 18B

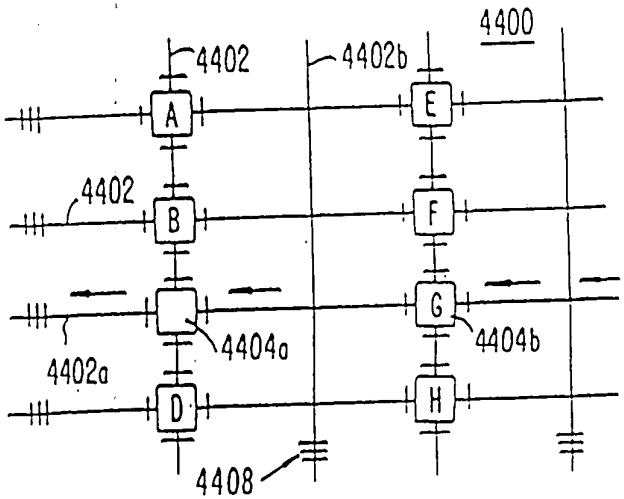


FIG. 18D.

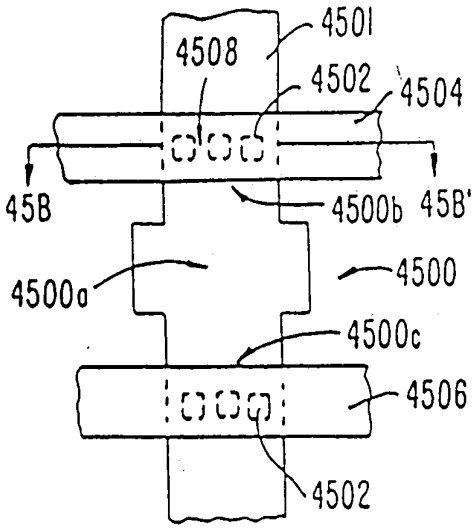


FIG. 19A

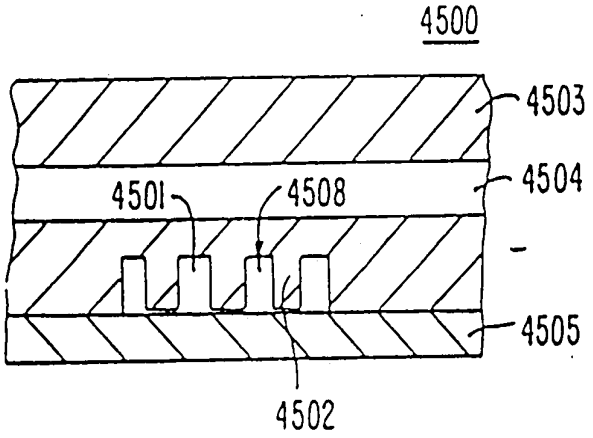


FIG. 19B

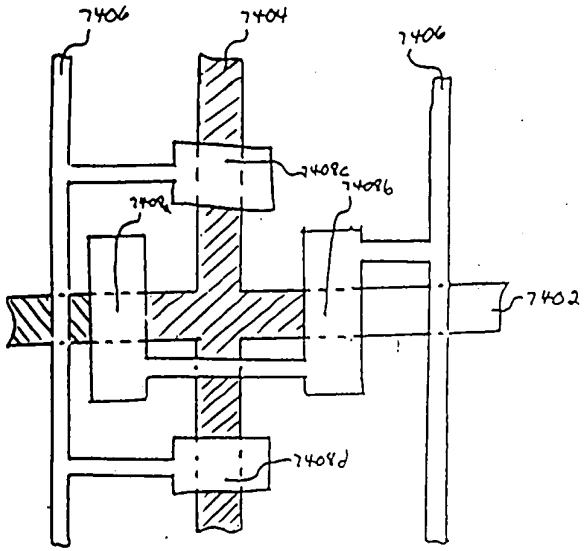


FIG. 20A

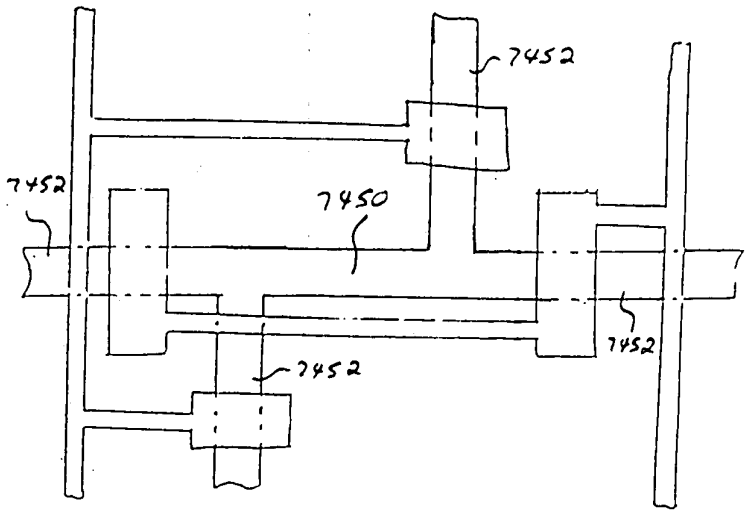


FIG. 20C

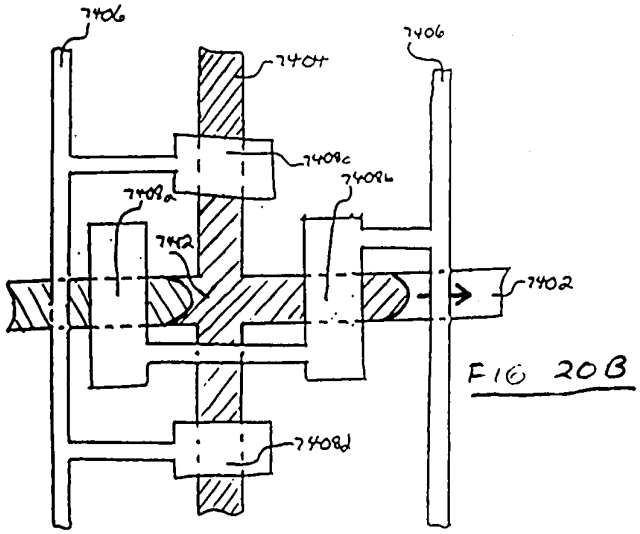


FIG 20B

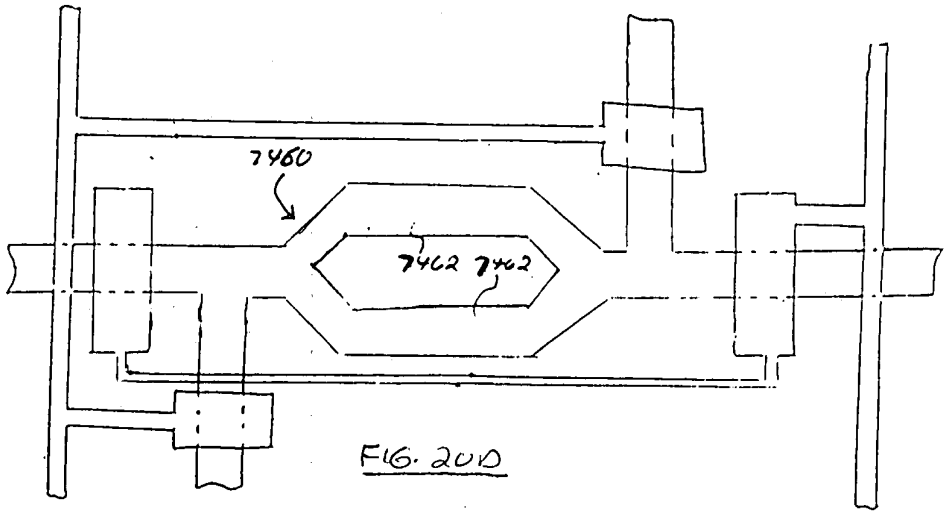


FIG. 20D

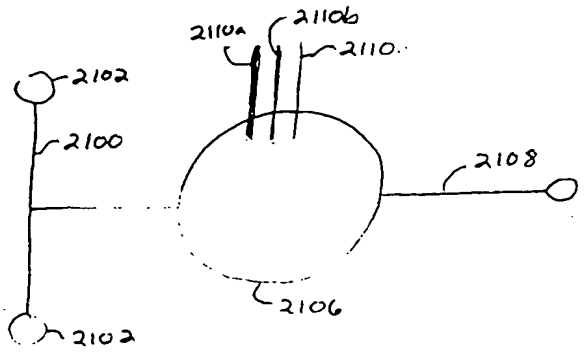


FIG. 21

FIG. 22A

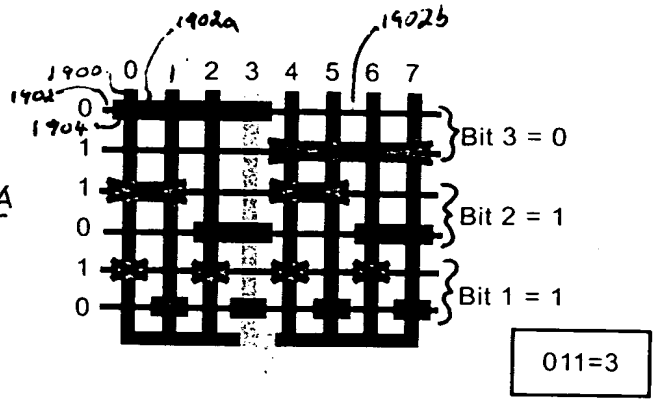


FIG. 22B

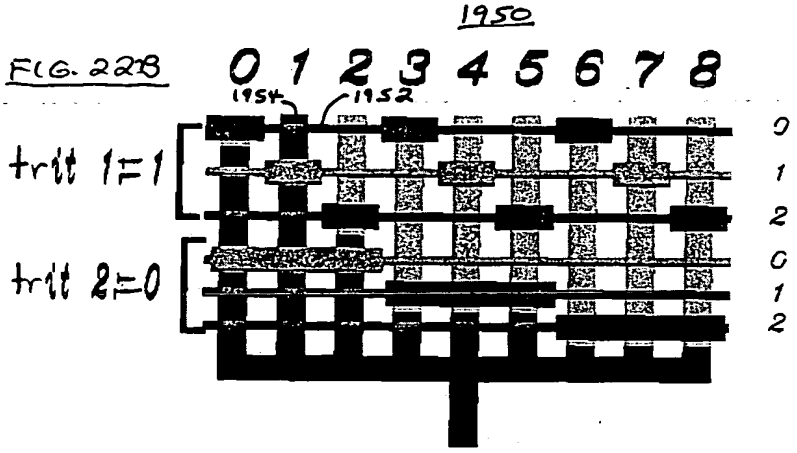
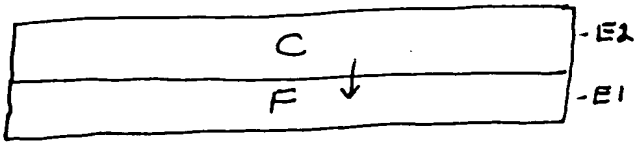


FIG. 22C



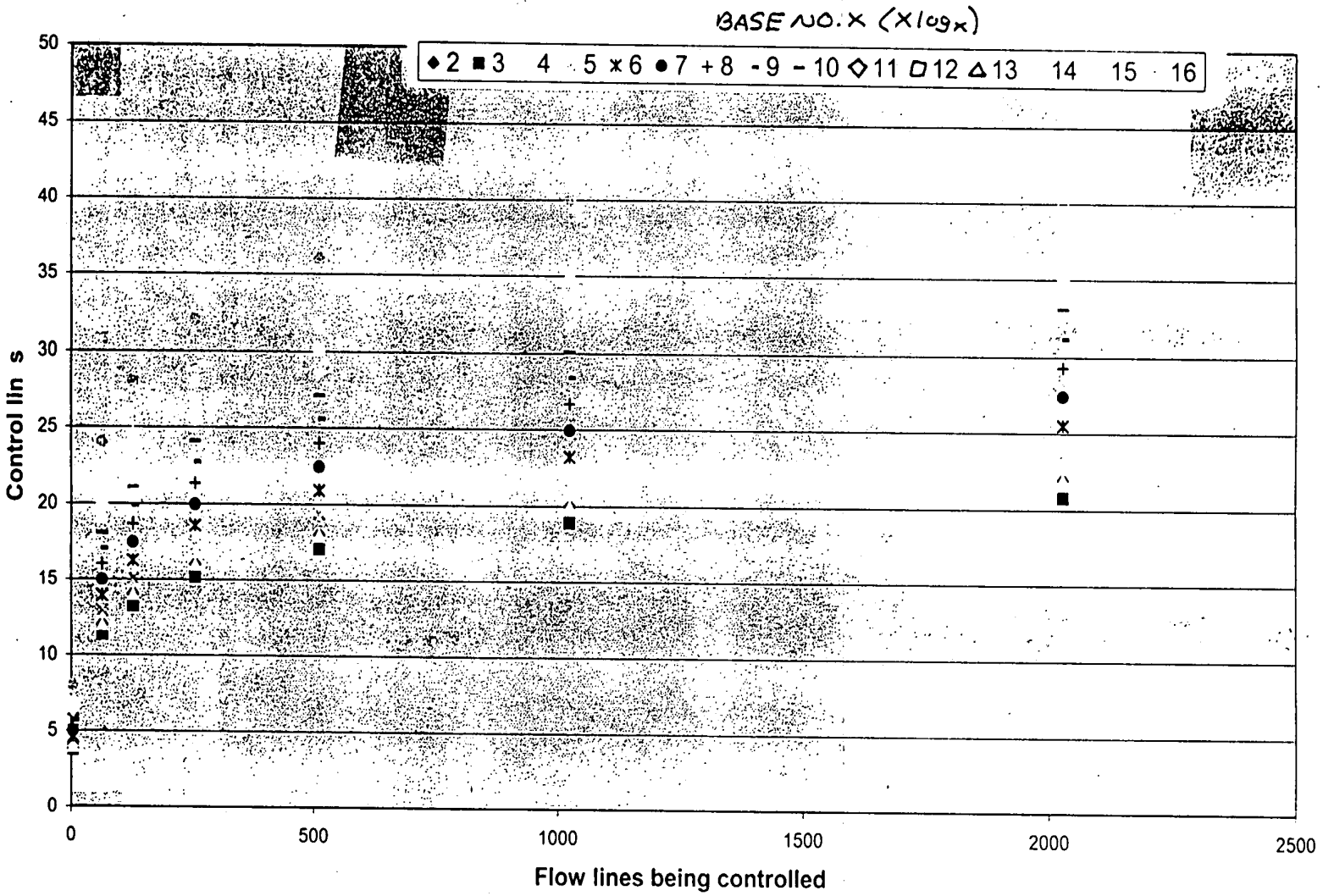

BASE NO. x (x log x)
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Control lin s
0
5
10
15
20
25
30
35
40
45
50
0
500
1000
1500
2000
2500
Flow lines being controlled

FIG. 23

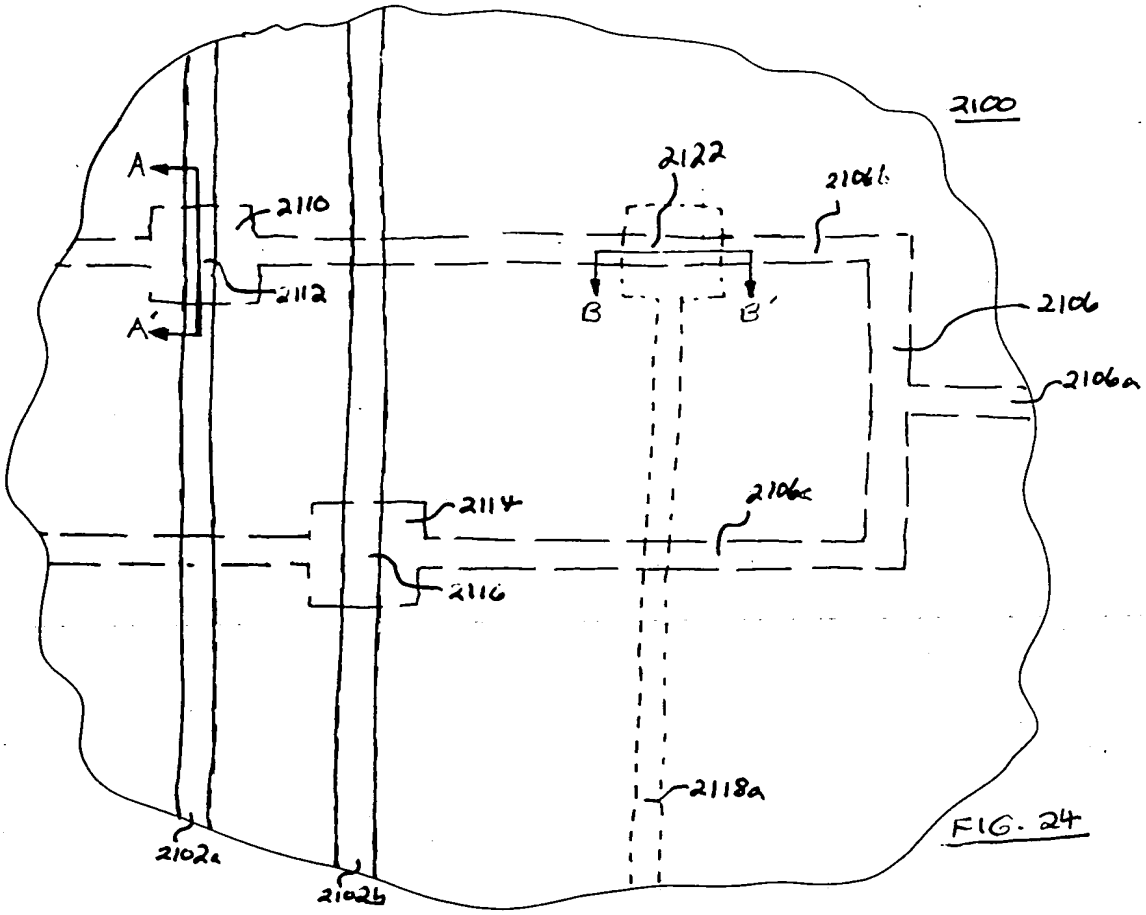


FIG. 24

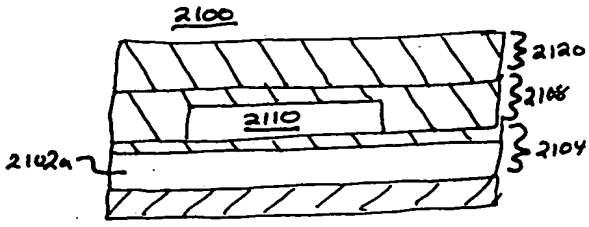


FIG. 24A

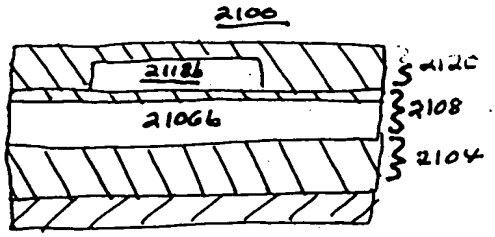


FIG. 24B

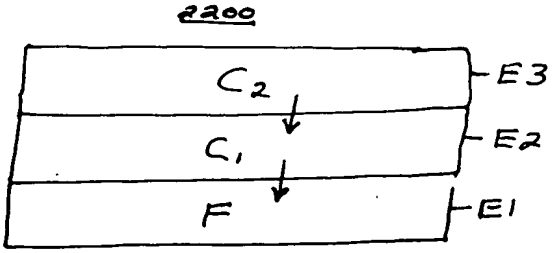


FIG. 25

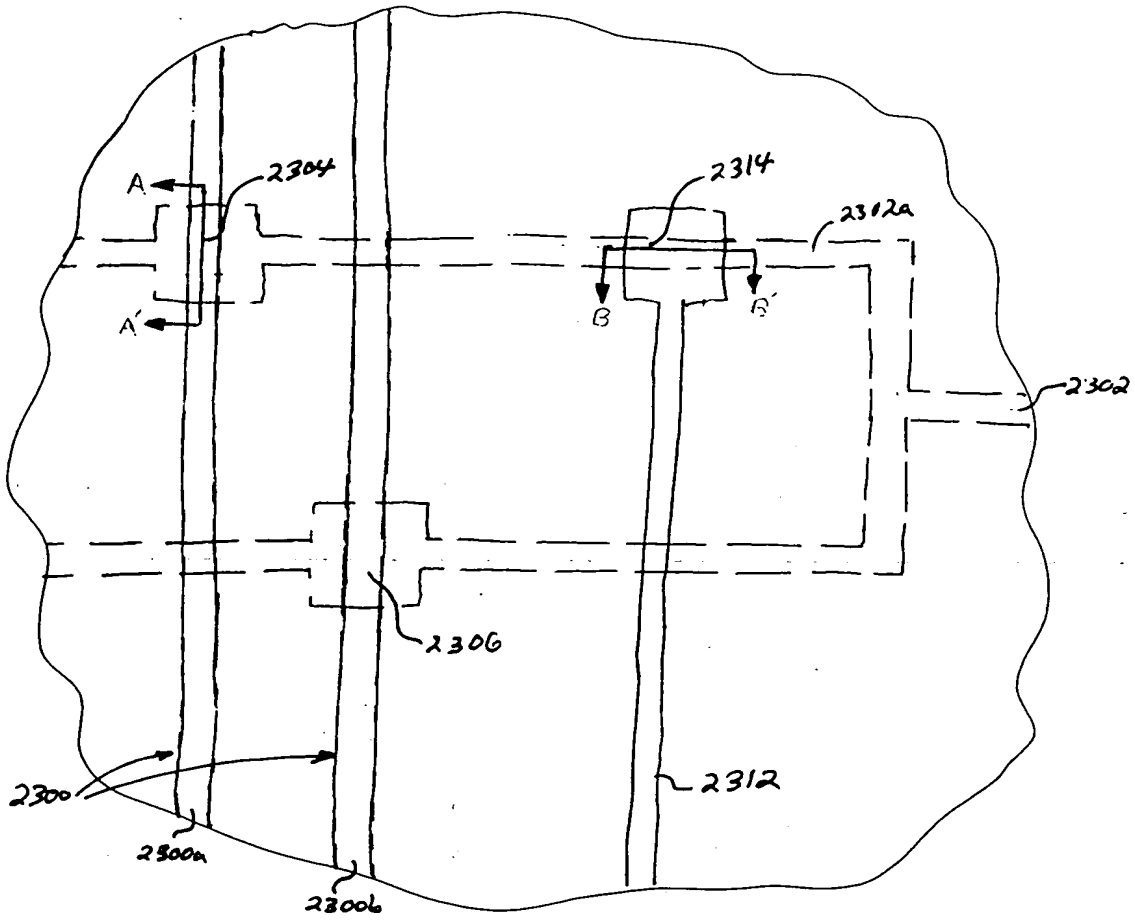


FIG. 26

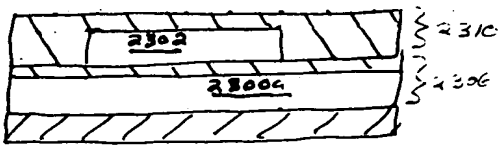


FIG. 26A

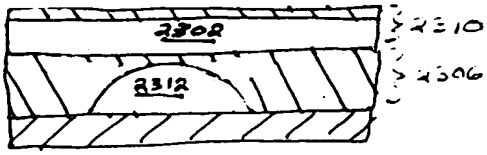


FIG. 26B

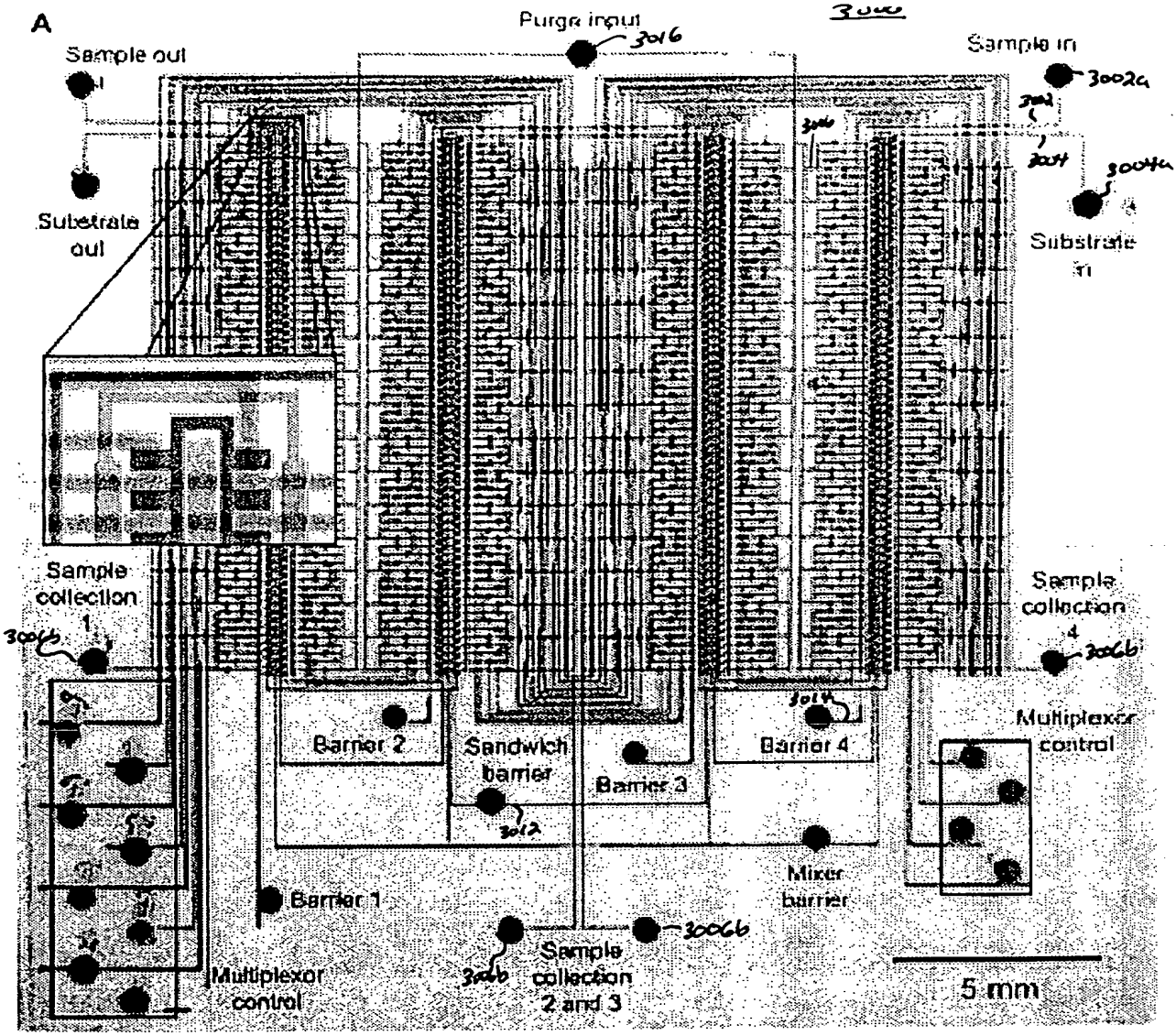


FIG. 27A

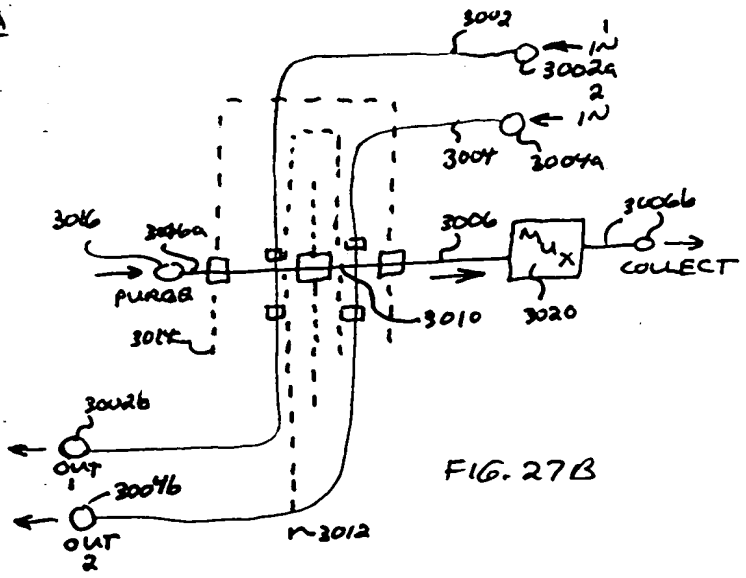


FIG. 27B

FIG. 27C

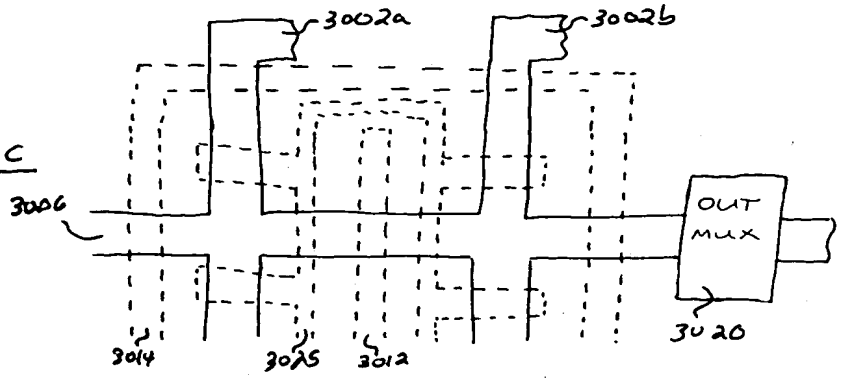


FIG. 27D

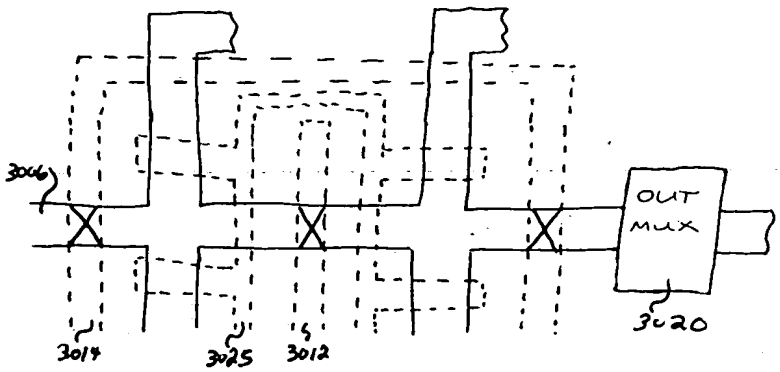


FIG. 27E

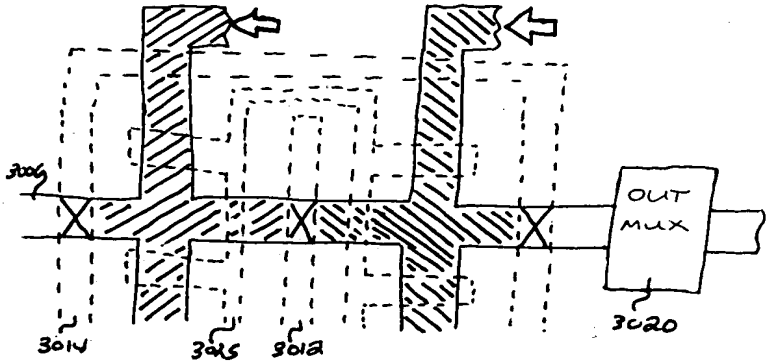


FIG. 27F

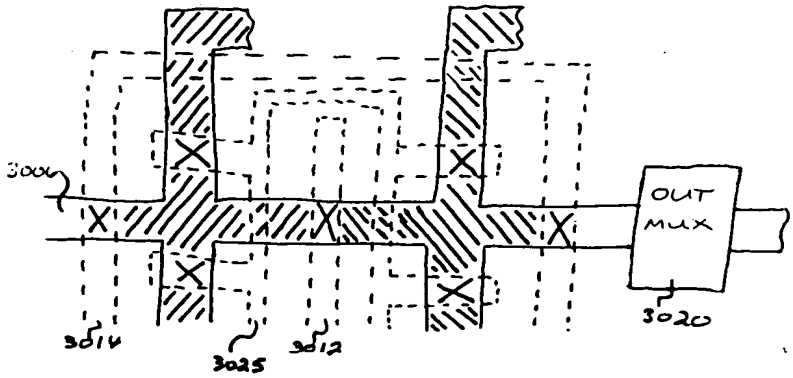


FIG. 27G

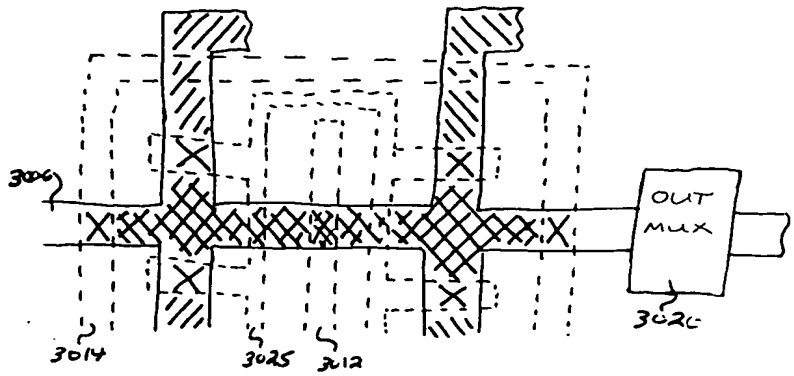
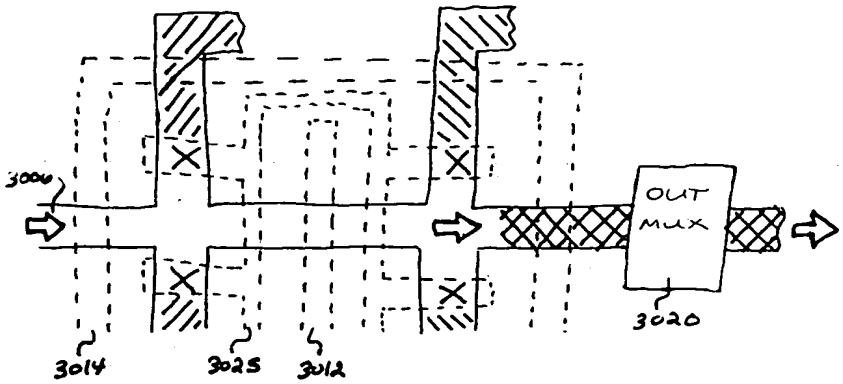


FIG. 27H



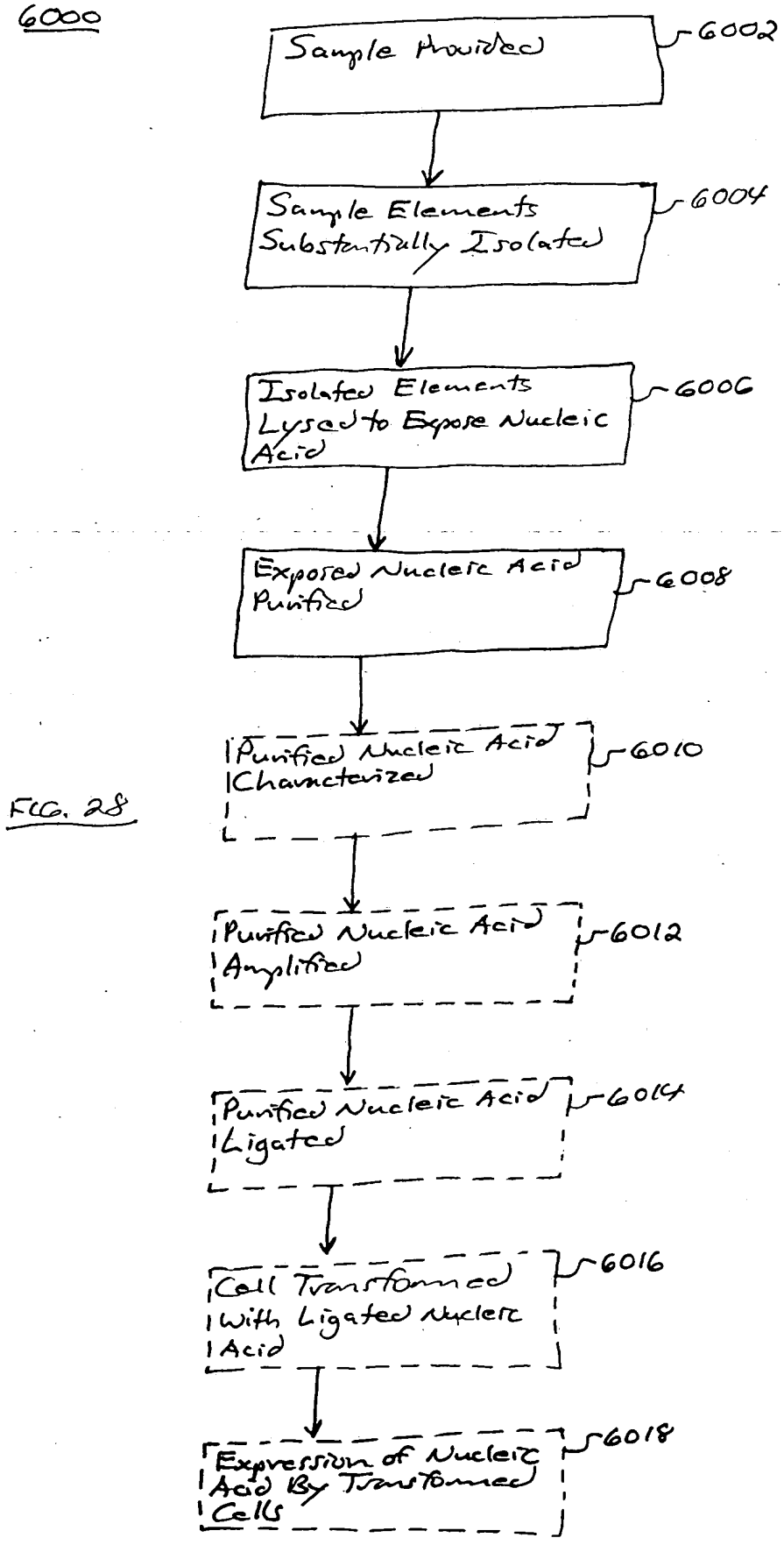

6000
Sample Provided
6002
Sample Elements Substantially Isolated
6004
Isolated Elements Lysed to Expose Nucleic Acid
6006
Exposed Nucleic Acid Purified
6008
Purified Nucleic Acid Characterized
6010
Purified Nucleic Acid Amplified
6012
Purified Nucleic Acid Ligated
6014
Cell Transformed With Ligated Nucleic Acid
6016
Expression of Nucleic Acid By Transformed Cells
6018

FIG. 28

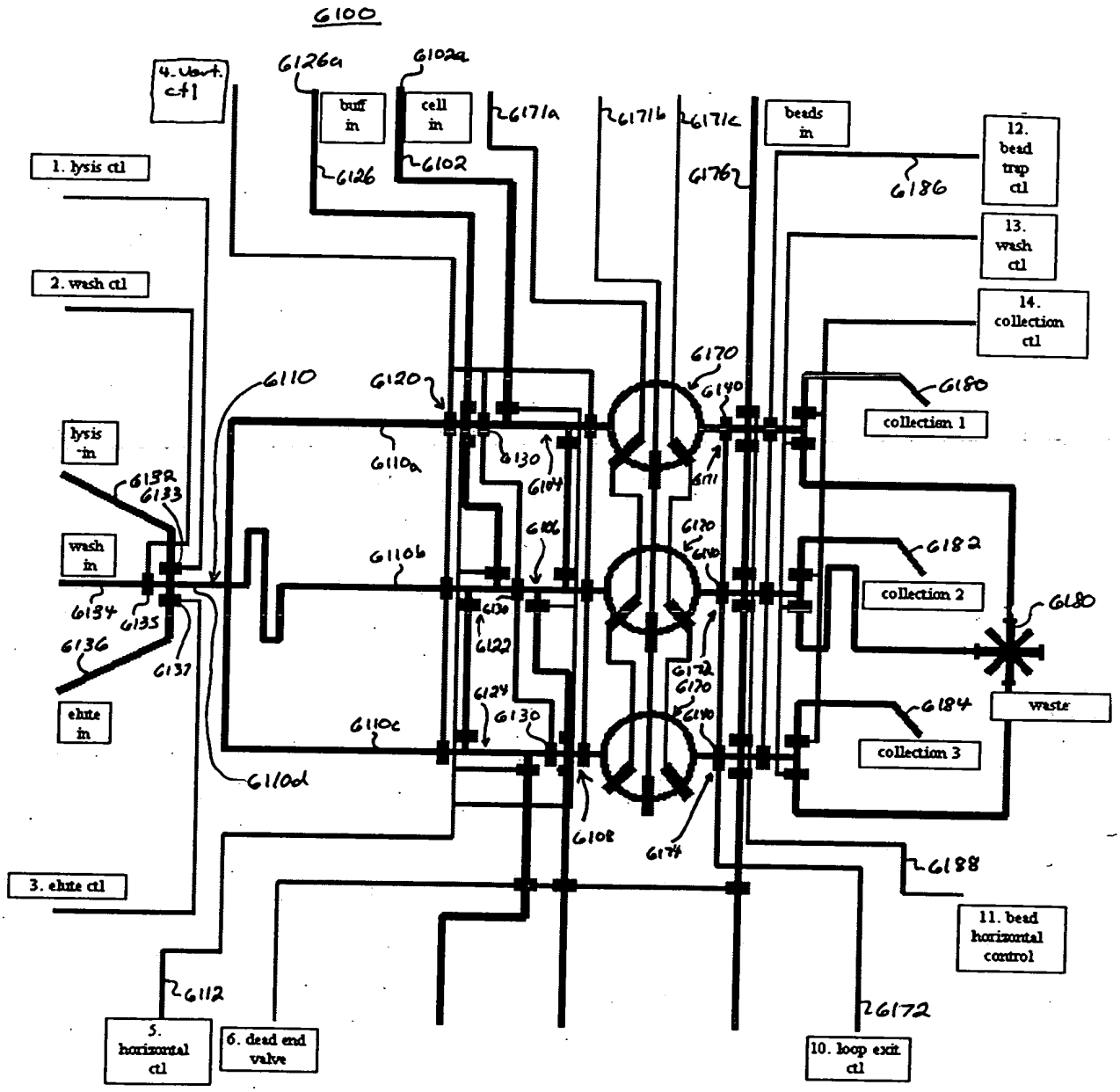

6100
4. vent ctl
6126a
6102a
buff in
cell in
6171a
6171b
6171c
beads in
12. bead trap ctl
1. lysis ctl
6126
6102
6176
6186
13. wash ctl
2. wash ctl
14. collection ctl
6110
6120
6170
6140
6180
collection 1
lysis in
6110a
6130
6104
6111
6132
6133
6106
6178
6140
6182
wash in
collection 2
6134
6135
6122
6180
6136
6137
6172
6170
6124
6130
6184
waste
elute in
6110c
collection 3
6110d
6108
6174
6188
3. elute ctl
11. bead horizontal control
6112
6172
5. horizontal ctl
6. dead end valve
10. loop exit ctl

FIG. 29A

6104

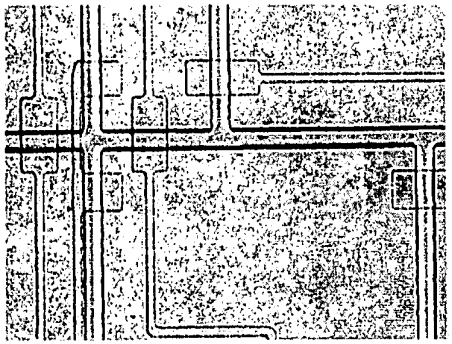


Fig. 29B

6170

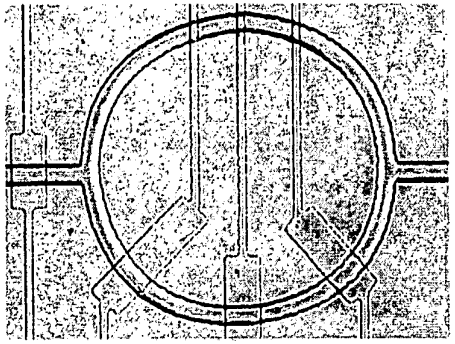


Fig. 29C

6171

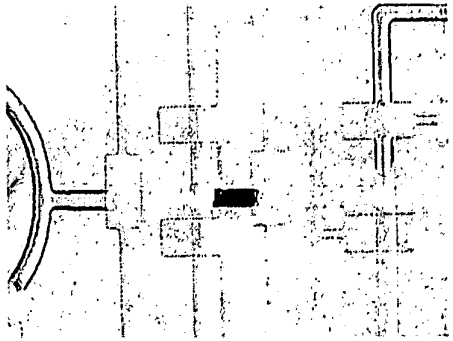


Fig. 29D

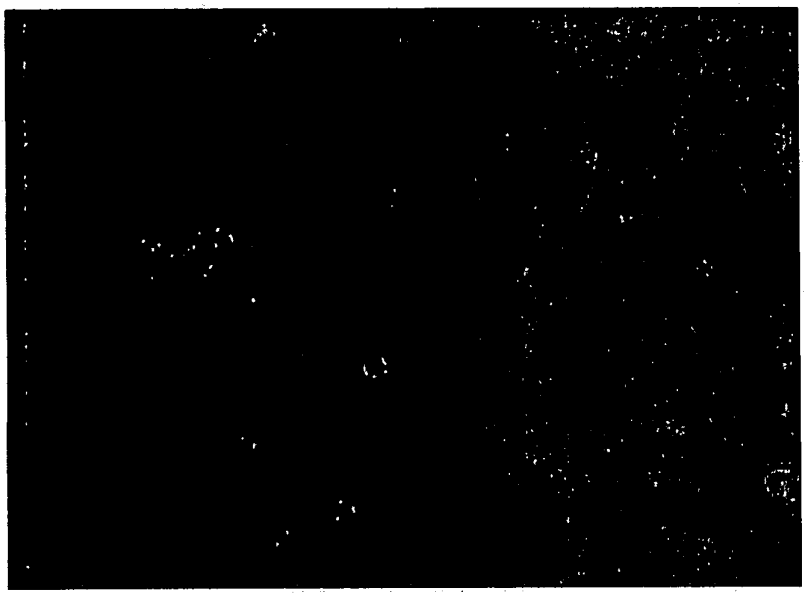


Fig. 30A

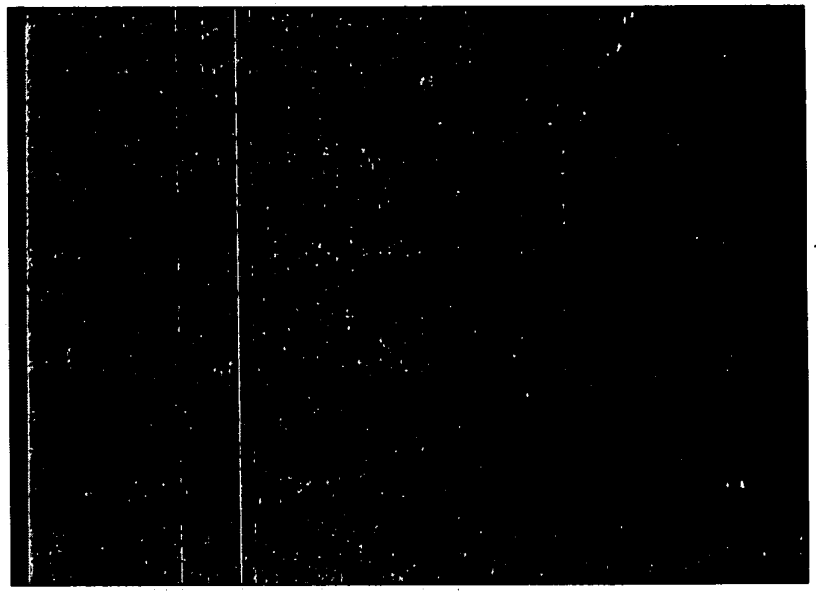


Fig. 30B

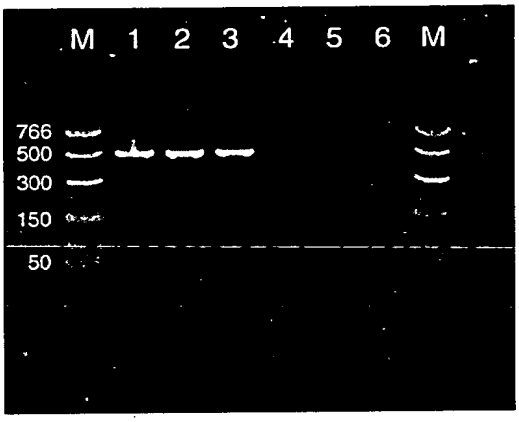


FIG. 31A

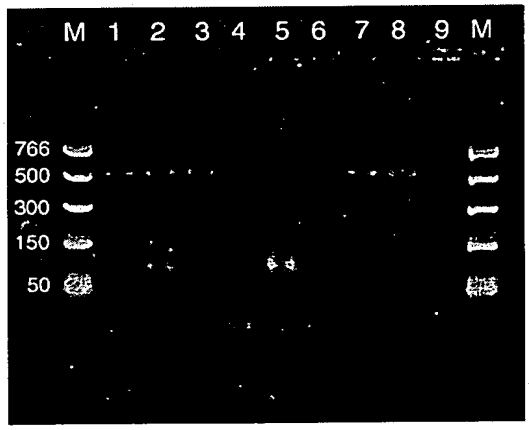


FIG. 31B

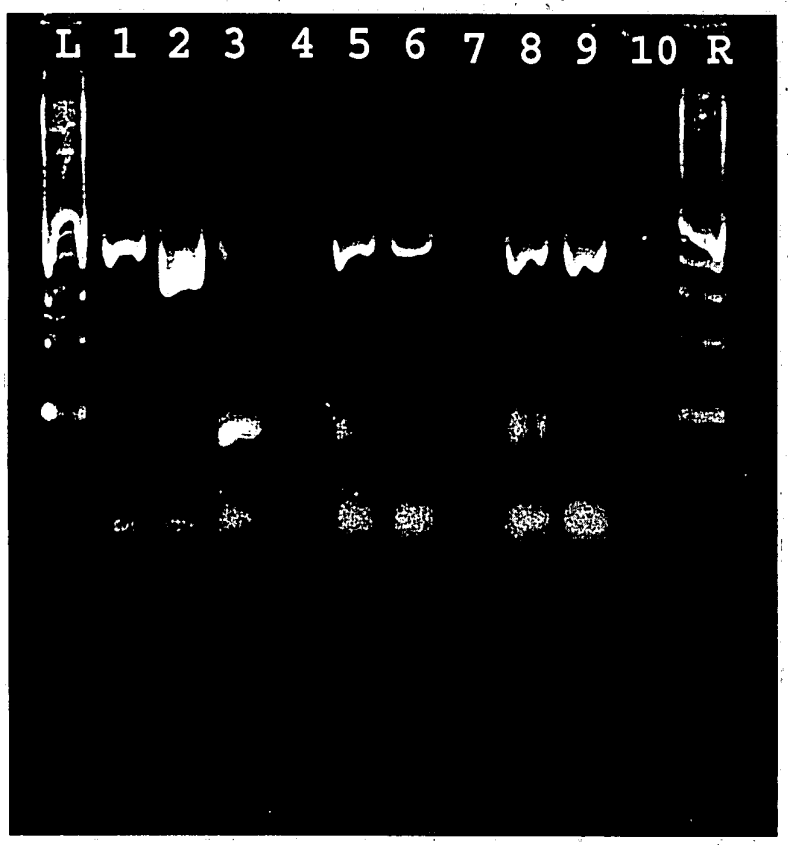


Fig 32A

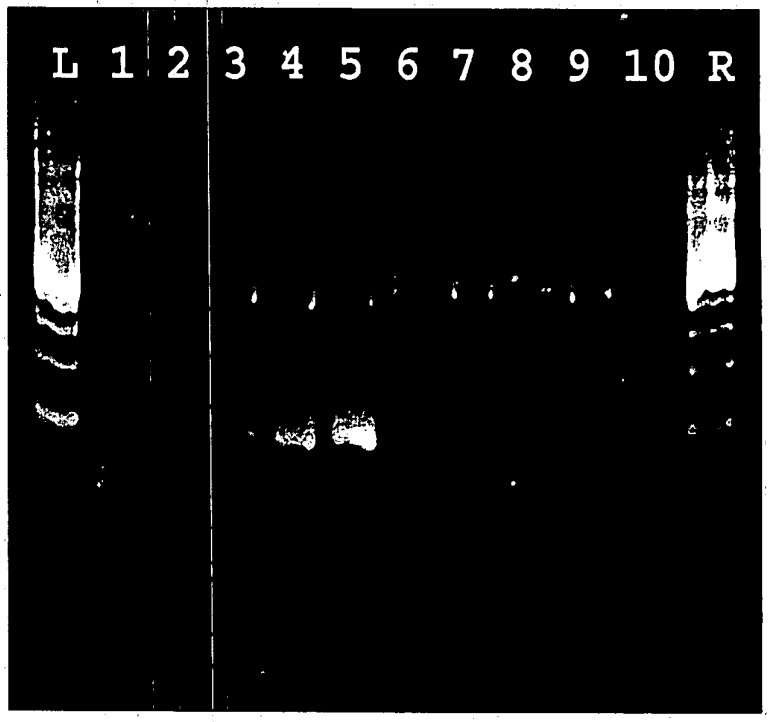


Fig 32B

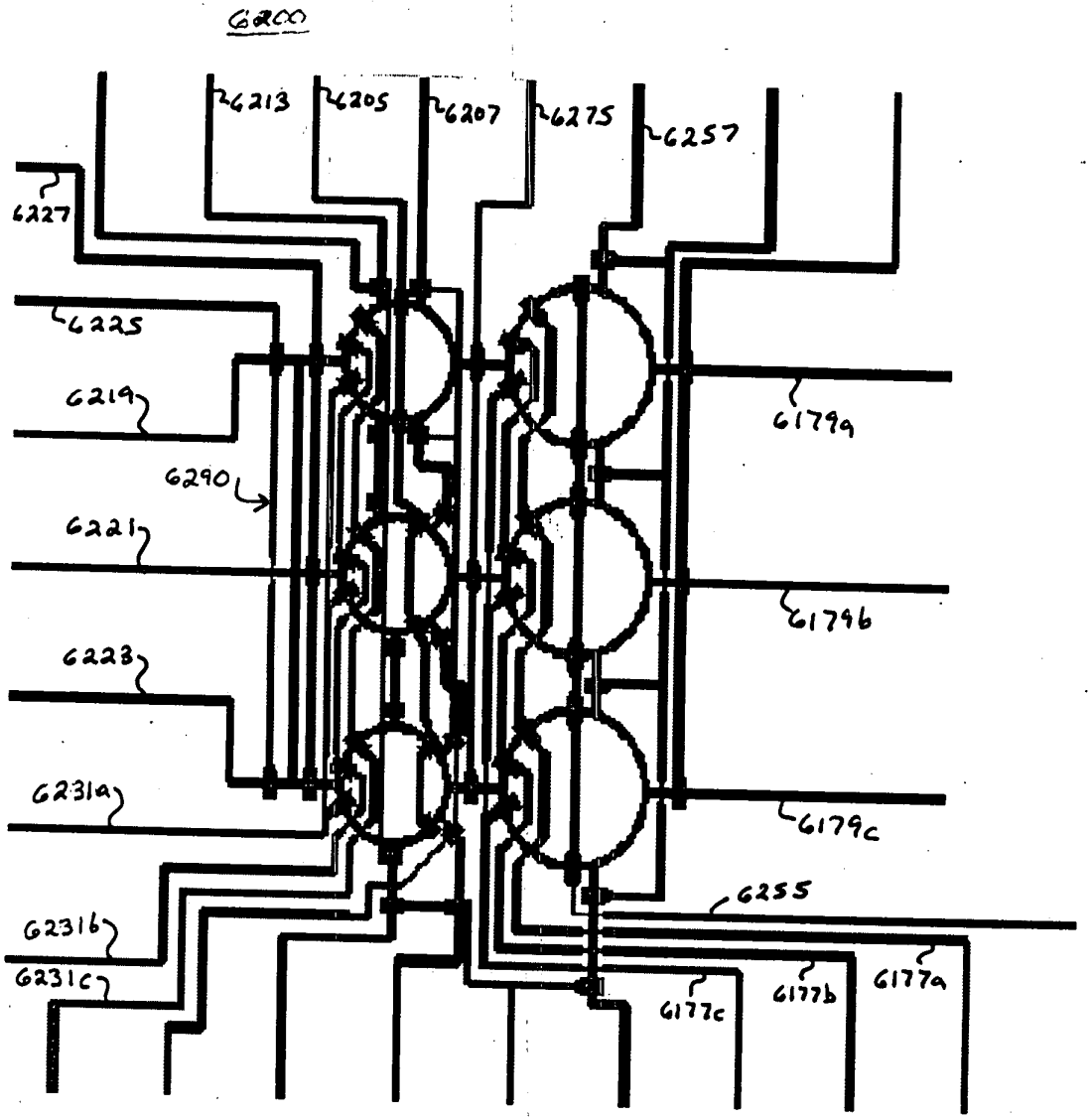

6200
6213
6205
6207
6275
6257
6227
6225
6219
6290
6221
6223
6231a
6231b
6231c
6179a
6179b
6179c
6255
6177c
6177b
6177a

FIG. 33

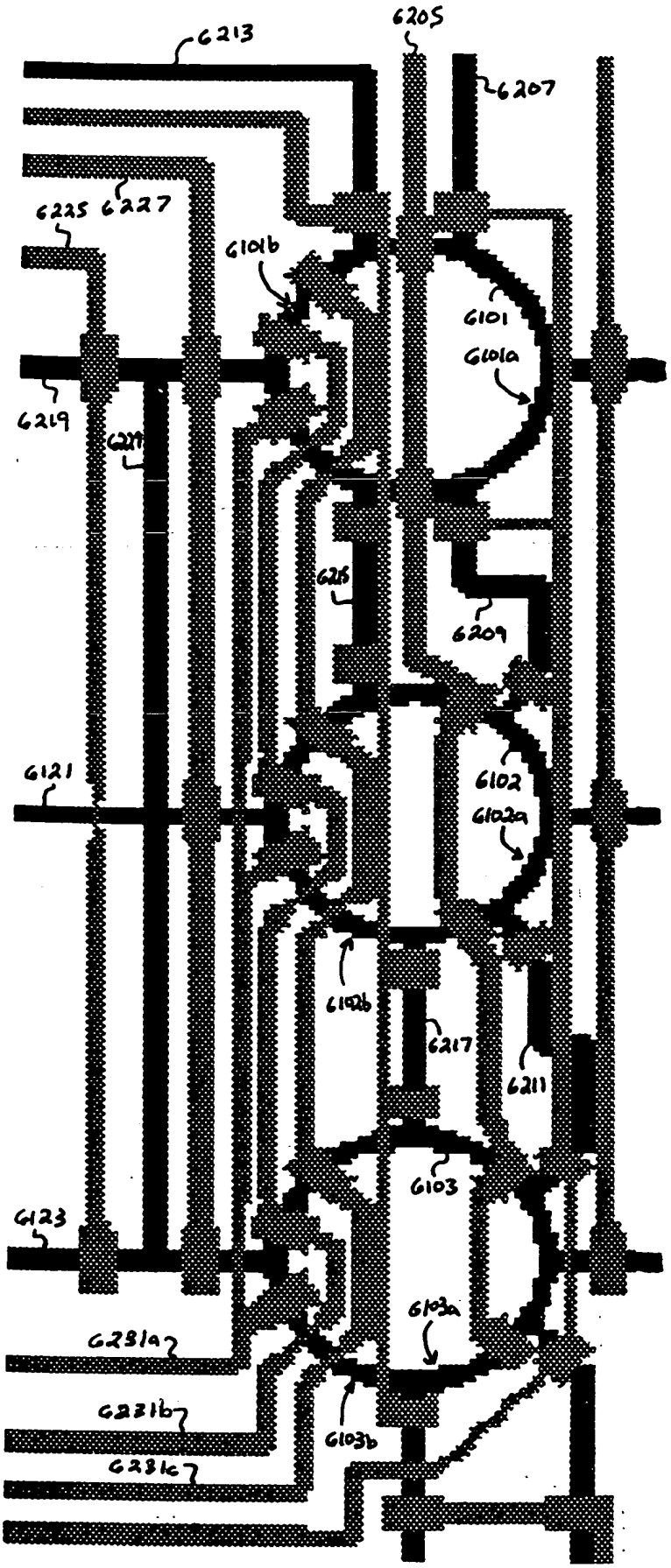


FIG. 33A

TO FIG. 33B

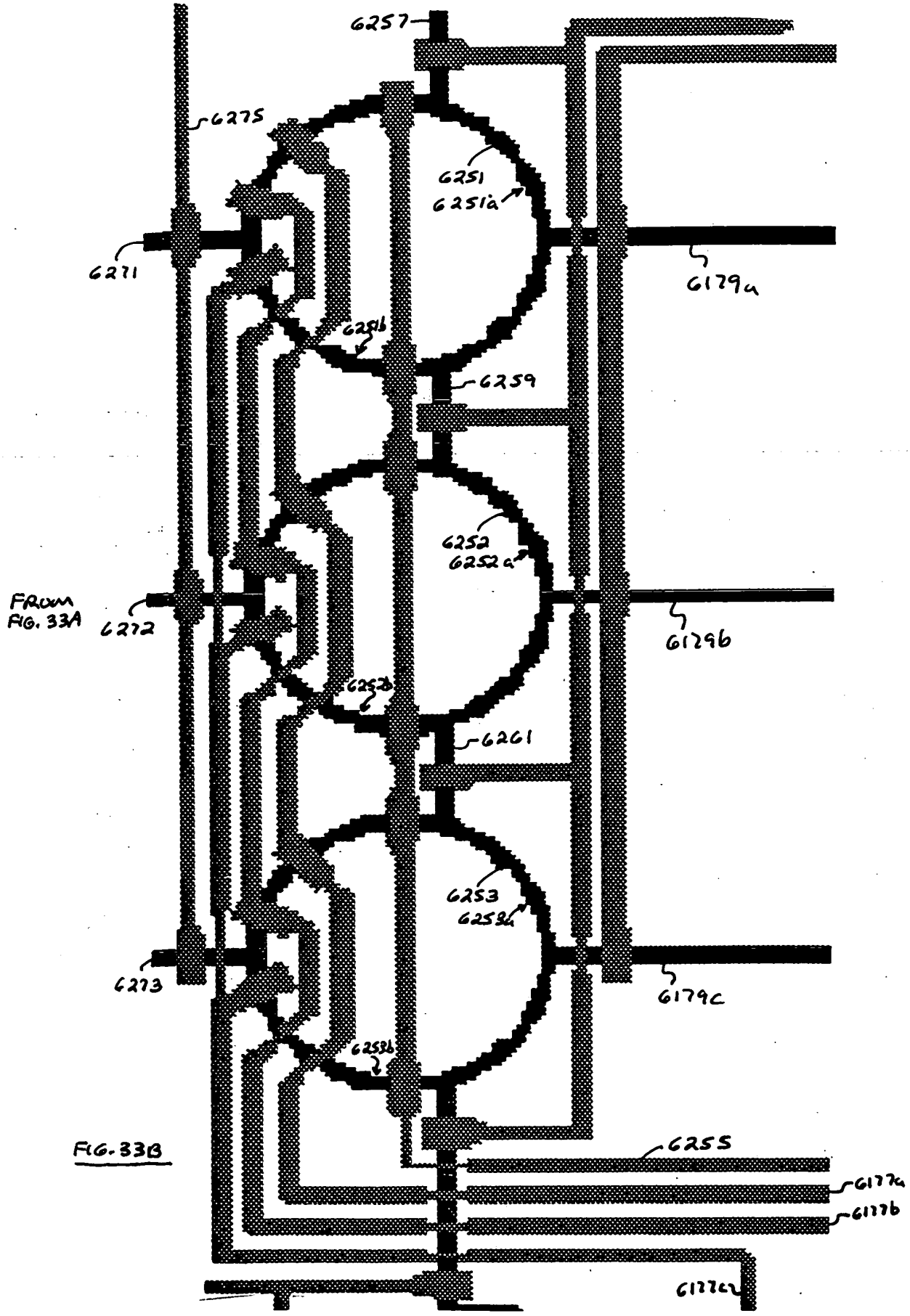

6257
6275
6251
6251a
6271
6179a
6258
6259
6252
6252a
FROM FIG. 33A
6272
6179b
6258
6261
6253
6253a
6273
6179c
6258
6255
6177a
6177b
6177c

FIG. 33B

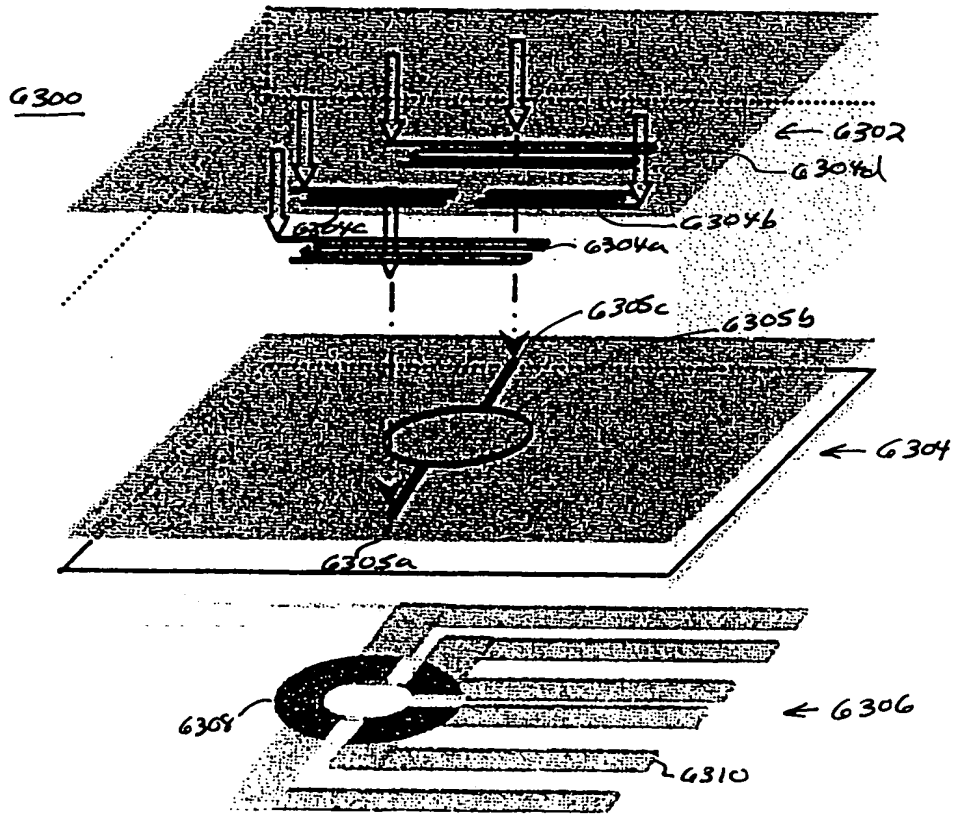

6300
6302
6304d
6304b
6304c
6304a
6305c
6305b
6304
6305a
6308
6306
6310

FIG. 34

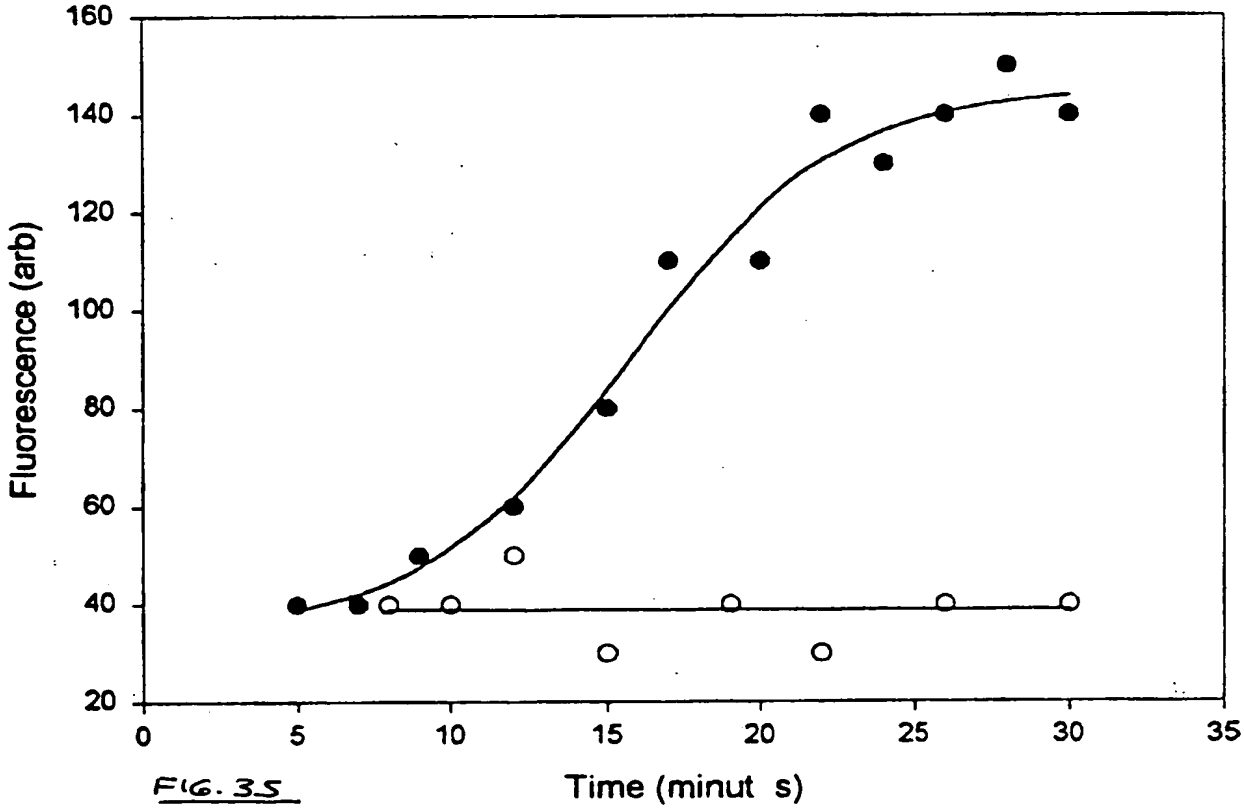

160
140
120
100
80
60
40
20
0
5
10
15
20
25
30
35
Fluorescence (arb)
Time (minut s)

FIG. 35

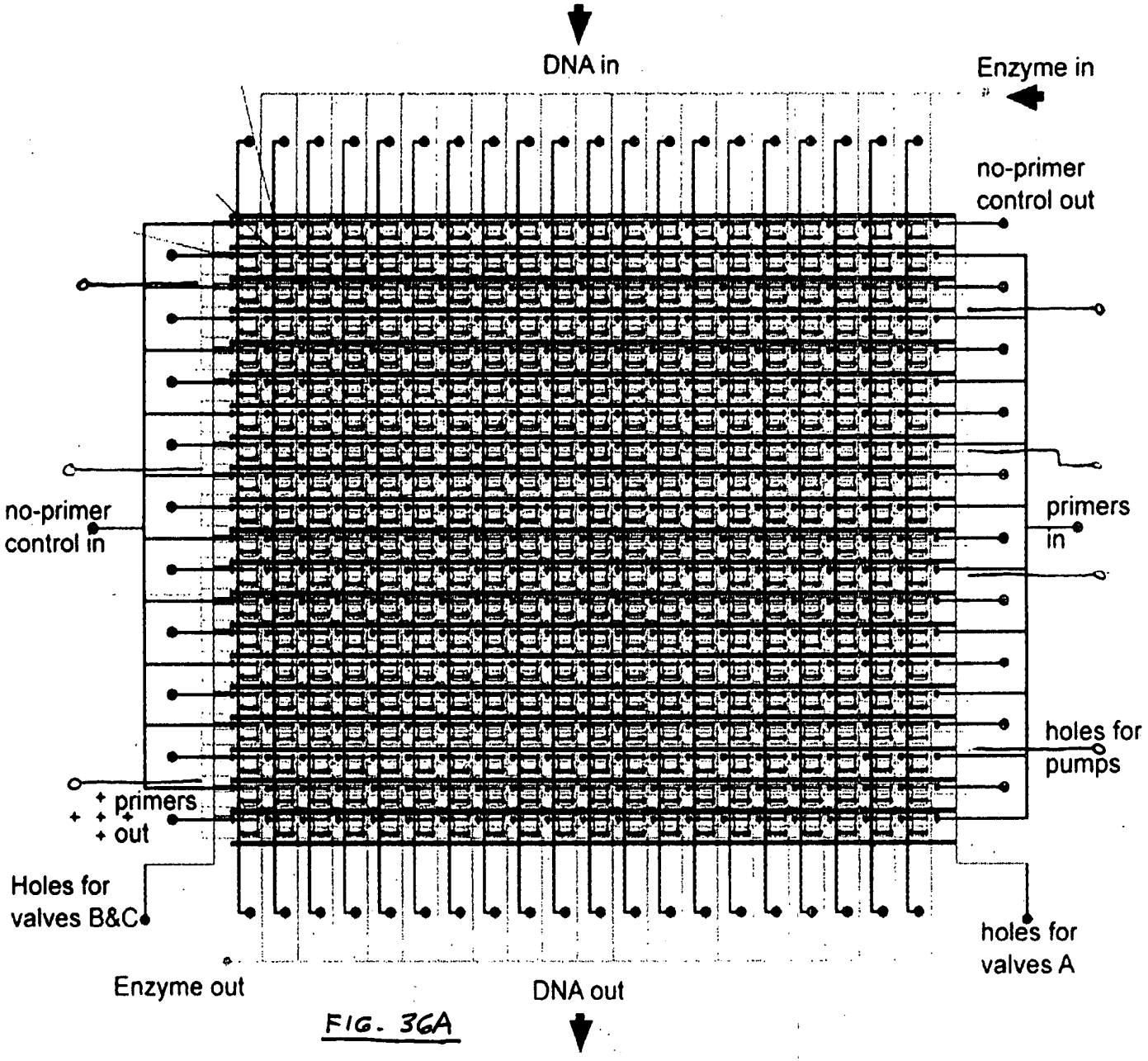

DNA in
Enzyme in
no-primer
control out
no-primer
control in
primers
in
holes for
pumps
primers
out
Holes for
valves B&C
holes for
valves A
Enzyme out
DNA out

FIG. 3GA

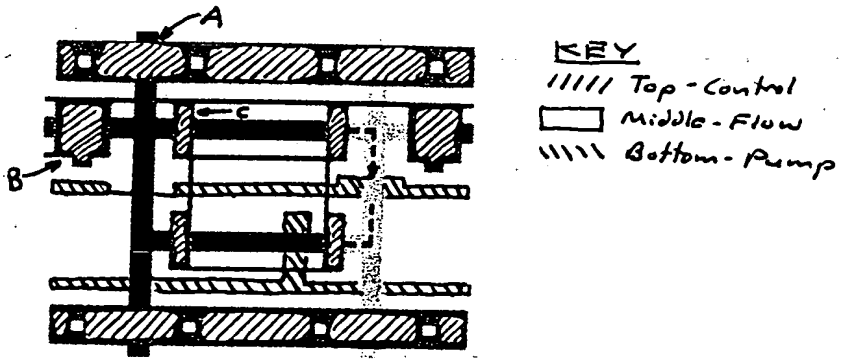


FIG. 3GB

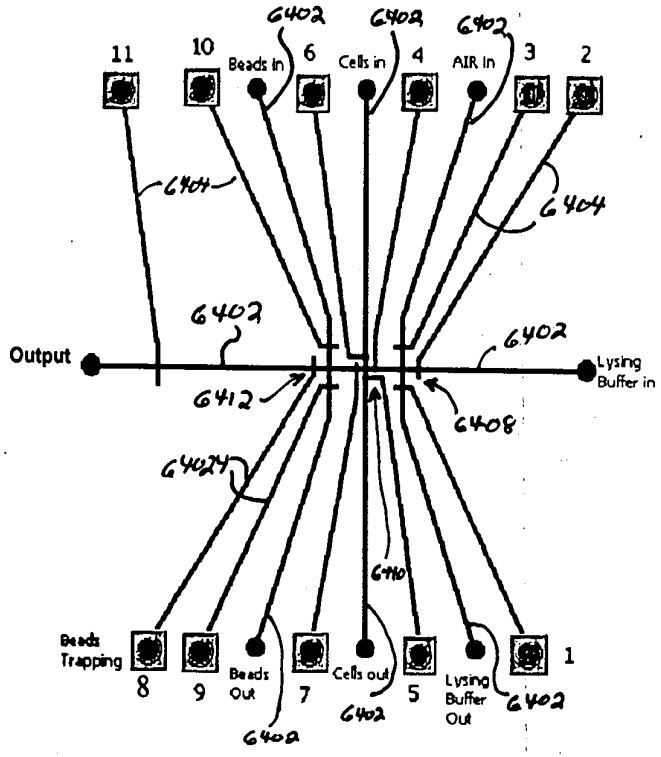

11
10
Beads In
6
Cells In
4
AIR In
3
2
6402
6402
6402
6404
6404
Output
6402
6402
Lysing Buffer In
6412
6408
6402A
6410
Beads Trapping
8
9
Beads Out
7
Cells out
5
Lysing Buffer Out
1
6402
6402
6402

FIG. 37A

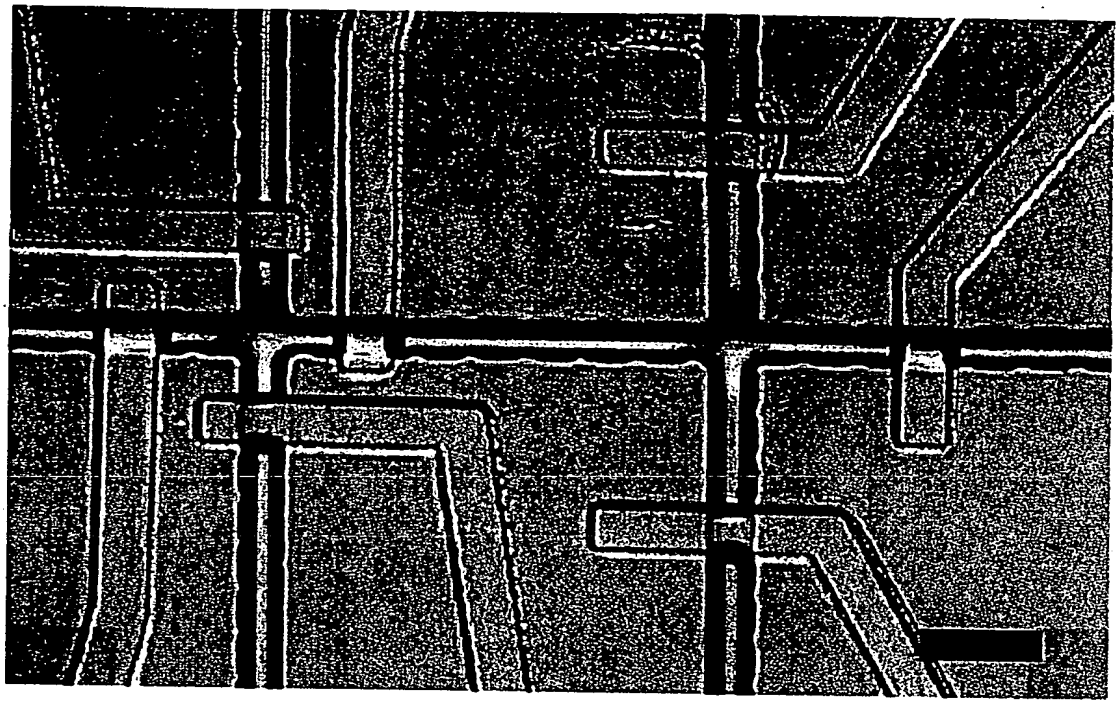


FIG. 37B

FIG. 37C

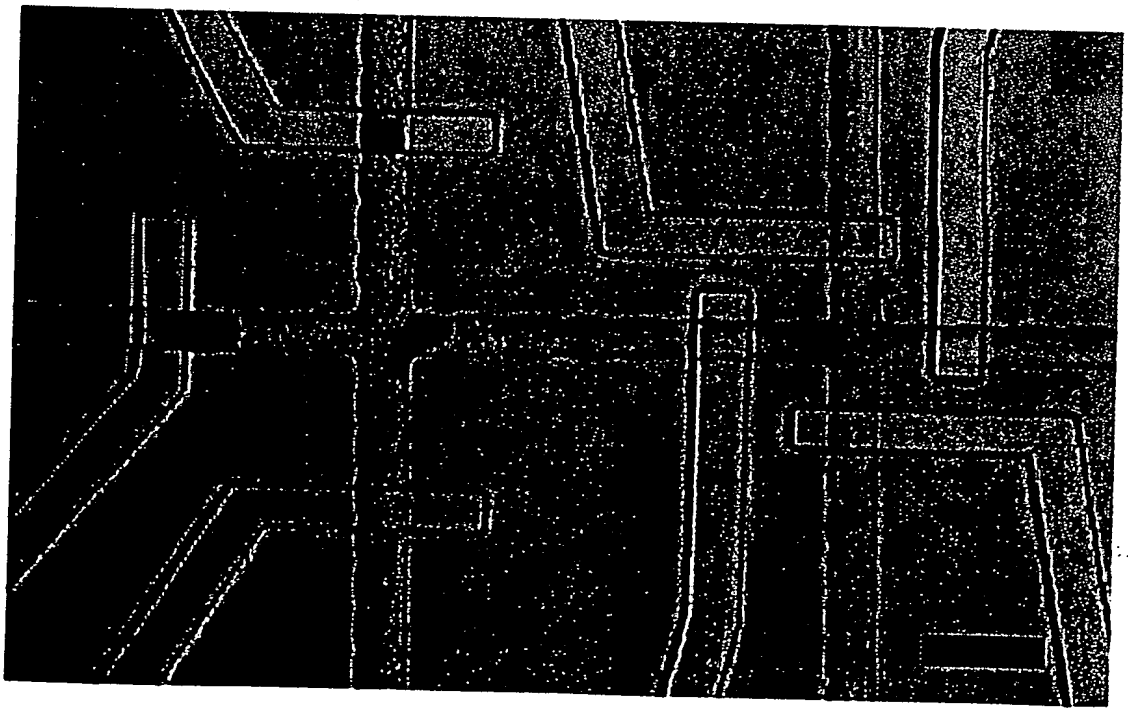


FIG. 37D

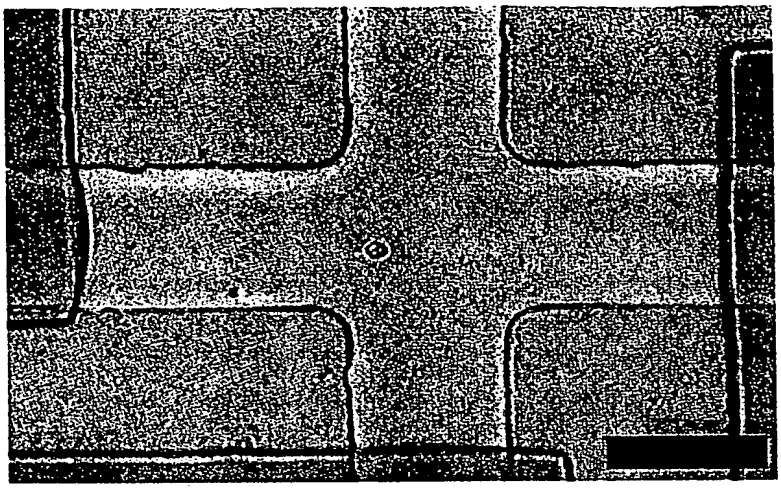


FIG. 37E

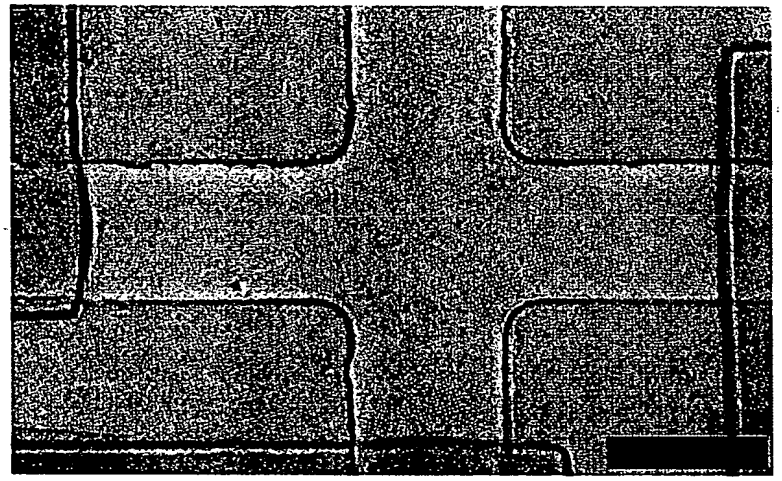


FIG. 37F

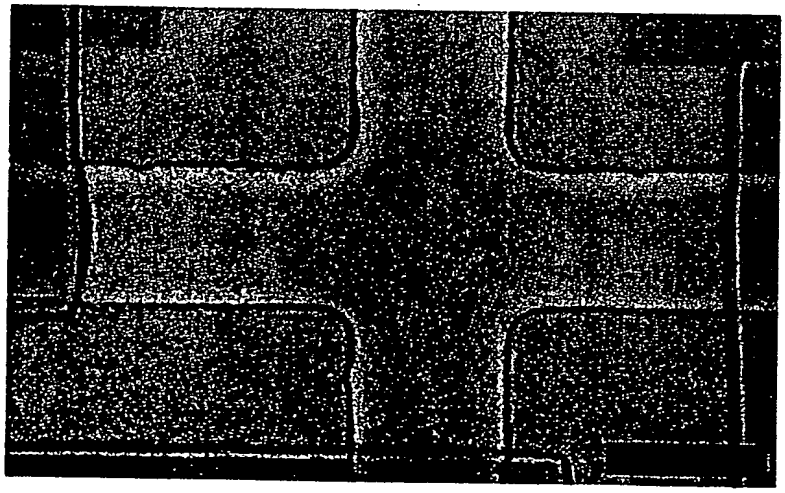
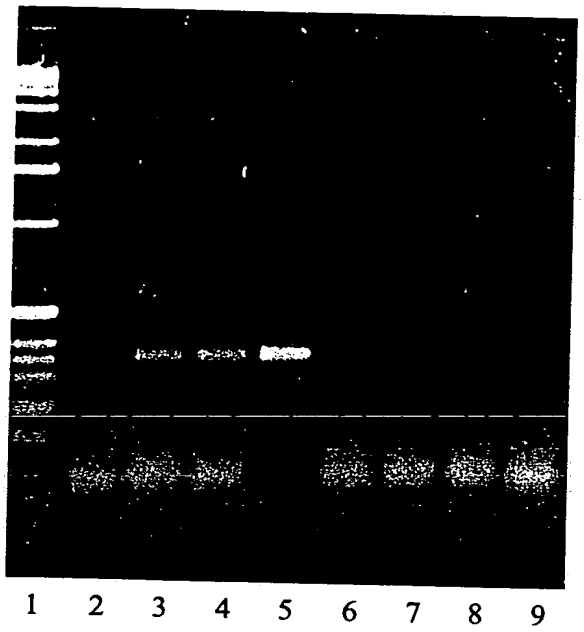


FIG. 38


1 2 3 4 5 6 7 8 9

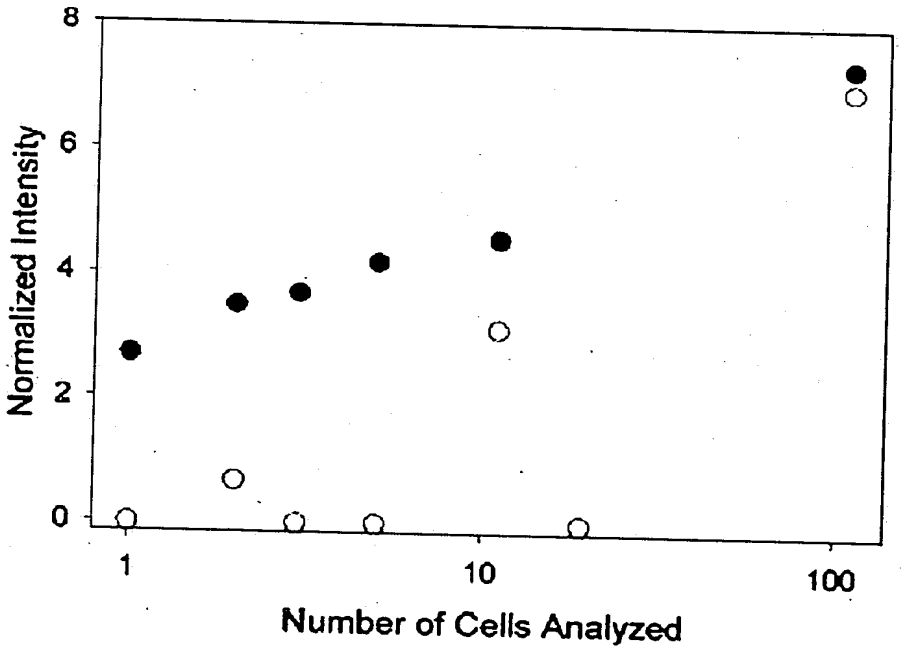

Normalized Intensity
0
2
4
6
8
1
10
100
Number of Cells Analyzed

FIG. 39

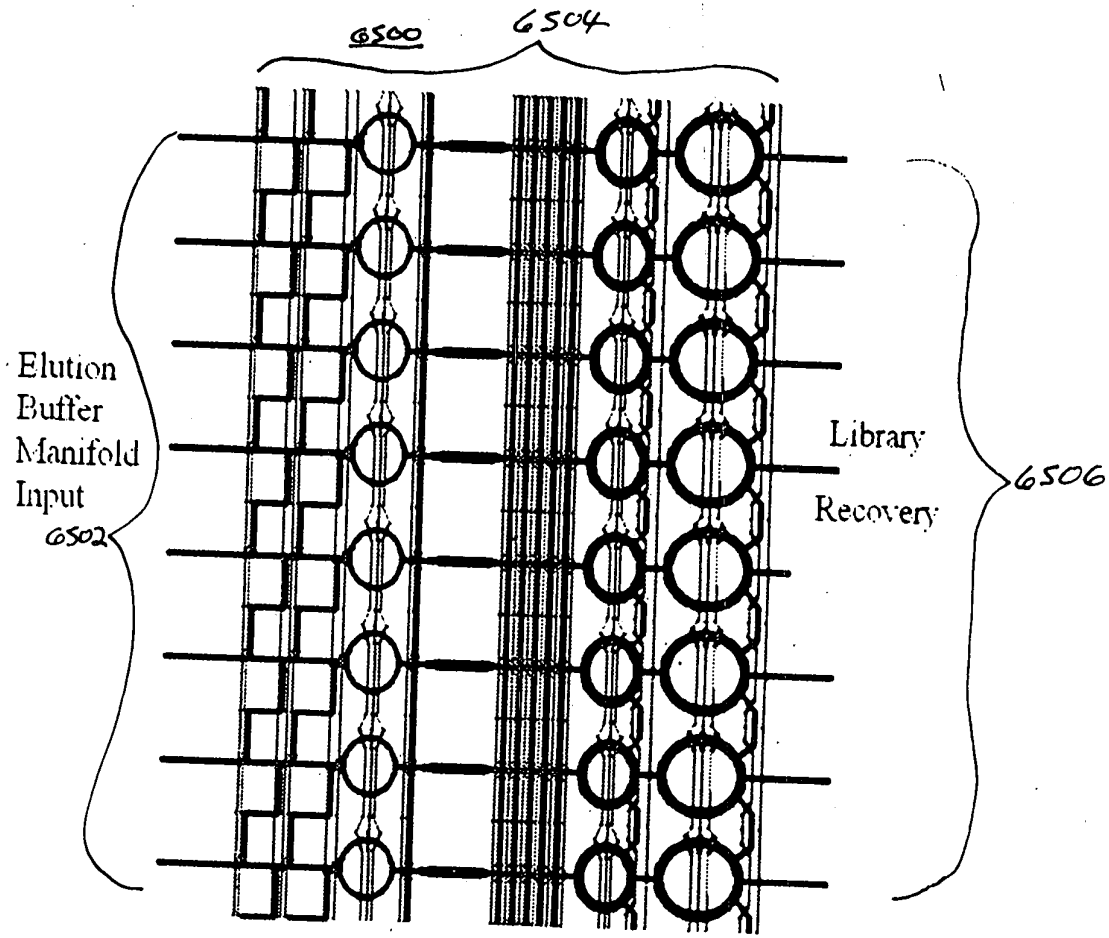

6500
6504
Elution
Buffer
Manifold
Input
6502
Library
Recovery
6506

FIG. 40

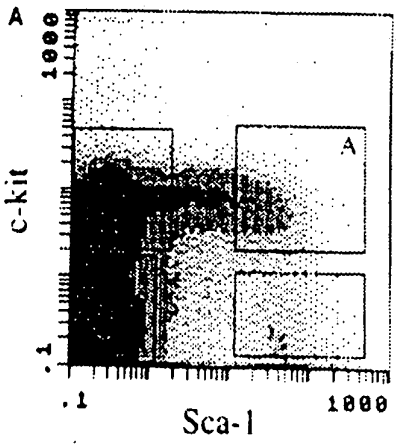


FIG. 41A

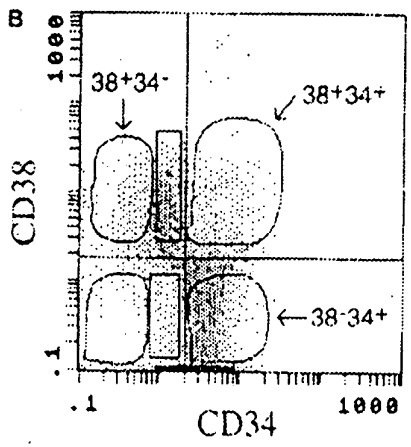


FIG. 41B

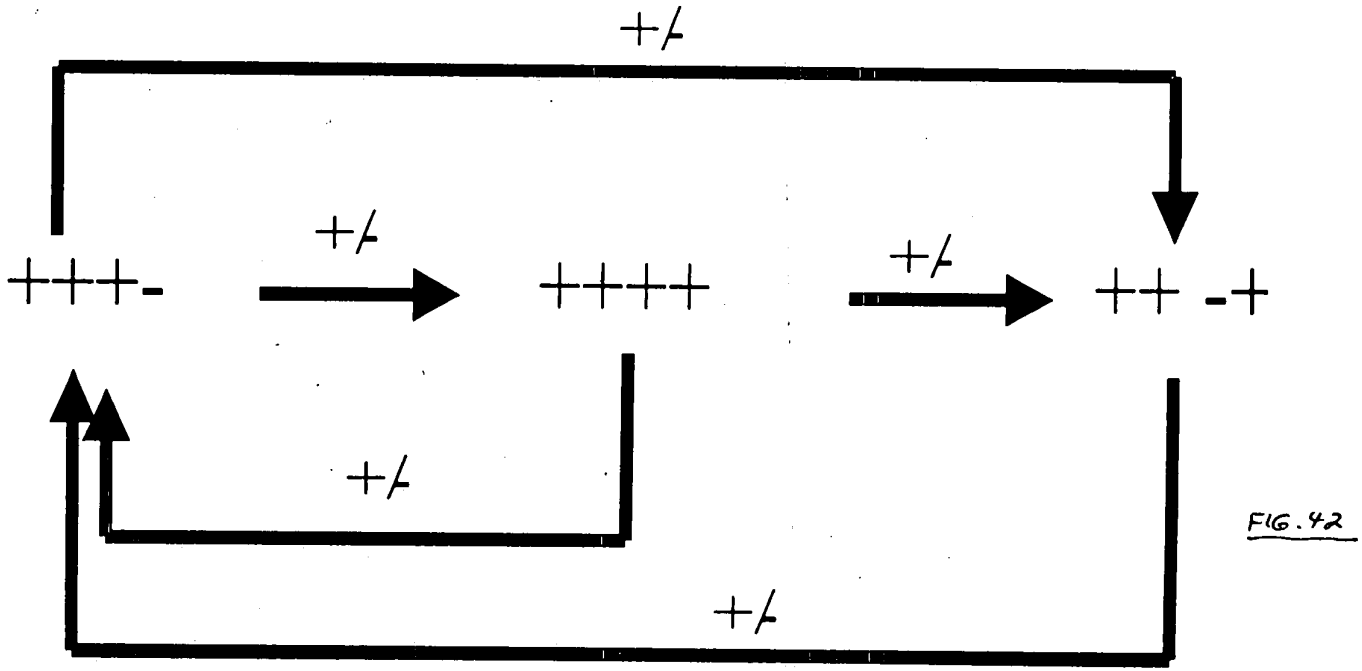


FIG. 42